

SHARP SERVICE MANUAL

CODE: 00ZER03RPSM-E

Remote Printer

MODEL ER-03RP

OPTION FOR ER-52BR · ER-8700
ER-4100 · ER-3300
ER-3310
IN LINE SYSTEM

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SHARP CORPORATION

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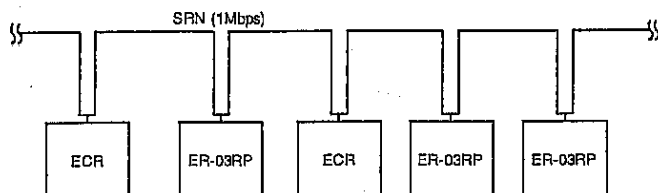
1. General

The ER-03RP is remote printer which uses the SRN (Sharp Retail Network) as external device which are used with ECR and POS terminal that has the same interface.

Functionally, the ER-03RP is nearly equal to and compatible with the current model ER-01RP, except that the ER-03RP does not have an auto cutter feature. (The command is sub-set of the ER-01RP.)

The ER-03RP is only available as a desktop model and cannot be mounted on a wall.

System diagram



- 1) The maximum number of option units depends on the system's application program.
- 2) The total cable distance should not exceed 1km.

2. Specification

1) External interface

SRN interface ... one host, n units of printers

ER52BR system n = 9 max.

ER8700 system n = 5 max.

ER3300/3310 system n = 9 max.

ER4100 system n = 9 max.

ER52BR/3300/3310 : US, CANADA Model

ER8700/4100 : Other

2) Control method

Controlled by the command from the host (ECR, POS)

3) Printer

Model: DP-614 serial dot printer

Printing area: 36 columns/line (normal mode)

18 columns/line (enlarge mode)

Font: 8 x 8 dot matrix

Print color: Black/red (two colors)

Print speed: 3.0 lines/second

Linefeed: 18 lines/seconds (fast mode)

4) Kinds of printing character sizes

Normal, Double size

5) Manual paper cutter (Tear bar)

6) Print data protection

Backed up by battery.

7) Installation

Desktop

8) Cabinet

Moisture tight

9) Print paper

Kind: Plain paper

Size: 76.0 ± 0.5mm, paper roll diameter 83mm

Thickness: 0.07 ~ 0.09

Weight: 52 ~ 64g/m²

10) Ink ribbon cassette

Color: Two colors of black and red

11) Character set

ASCII conforming 7-bit/8-bit character

12) Operation mode

Self test

On-line (normal print mode)

Off-line (standby mode)

Print halt mode

13) Outlook

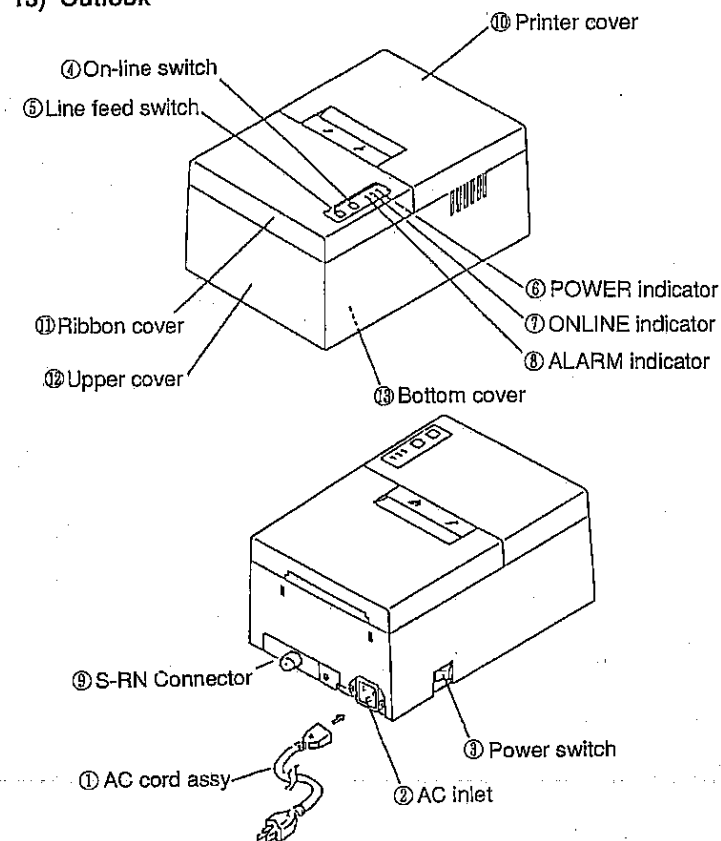


Fig. 1-1

14) Size/Weight

176(W) x 263(D) x 125(H)mm (include to connector)

(6.9"(W) x 10.4"(D) x 4.9"(H))

3.2kg (112.8 lbs)

15) Power source/Power consumption

AC local voltage (±10%) 50/60Hz

Max. 30W

16) Ambient temperature, humidity

0°C ~ 40°C (32 ~ 104°C)

30% ~ 90%

17) Reliability

Printer (except dot head): MCBF 2.5 million line

Dot head: 50 million characters

Ink ribbon: Approx. 2 million characters

18) Description of Each Block (Ref. Fig. 1-1)

- ① AC cord assy Insert the connector into the AC inlet of the printer and the plug into an AC outlet.
- ② AC inlet An inlet for power input. Insert the connector of the power cord assy into this inlet.
- ③ Power switch Set the switch ON to turn on power to the printer.
- ④ Online switch Press the switch to set the printer to the select (online) mode. Press the switch again to set the printer to the deselect (off-line) mode. The switch is also used to reset the alarm.

When the switch is pressed during the printer operation, the printer is set to the deselect mode after printing the current line.

Setting the power switch ON with the on-line switch held down will initiate the master reset operation.

- ⑤ Line feed switch Press the switch to feed the paper (in the deselect mode only). The switch is used when loading new paper or when typing space between lines.
- ⑥ POWER indicator (yellow green) Comes on when the power switch is set ON, and goes off when it is set OFF.
- ⑦ ONLINE indicator (yellow green) Comes on when the printer is set to the select (online) mode, and goes off when it is set to the deselect (off-line) mode. Printer operation is possible only when the indicator is on.
- ⑧ ALARM indicator (red) Lights when the printer trouble occurred or when the paper has depleted. When the indicator turns on, both the printer and line feed operations are disabled. To reset this condition, either press the on-line switch or turn off and on the printer power.
- ⑨ Connector Used to connect the printer to the SRN host via a cable. Check that the power is off to both the printer and the SRN host when connecting the cable.
- ⑩ Printer cover Open the cover to replace the paper.
- ⑪ Ribbon cover Open the cover to replace the ribbon.
- ⑫ Upper cover
- ⑬ Bottom cover

3. Setting of Dip switches

Remove the bottom cover of the remote printer to access the three 8-position dip switches.

The following describes the dip switch functions.

3-1. SW1 (DS1)

- SW1-1 Used to select CR code enable/disable.
 ON: CR code enabled
 OFF: CR code disabled

SW1-2,3,4 Used to select the diagnostic program type.

SW1-2	SW1-3	SW1-4	Function
ON	ON	ON	ROM/RAM test
OFF	ON	ON	Host terminal emulation mode
ON	OFF	ON	RAM verify
OFF	OFF	ON	Dip switch scan test
ON	ON	OFF	Print test
OFF	ON	OFF	SRN flag continuous transmission *1
ON	OFF	OFF	SRN packet continuous transmission *1
OFF	OFF	OFF	Line inspection program

*1 These two tests are collectively referred to as the SRN basic test.

The above dip switch settings are effective only when the diagnostic mode is ON (SW1-7 ON). For details of the diagnostic programs, refer to Section 3-3.

SW1-5,6

Used to select the code conversion type

The remote printer provides two different types of code conversion to handle the difference of code systems between dissimilar machines. The switch is used to select which type of code conversion to adopt.

SW1-5	SW1-6	Conversion type
OFF	OFF	Type 1
ON	OFF	Type 2
OFF	ON	No code conversion
ON	ON	No code conversion

SW1-7

Used to set the diagnostic mode.

Upon power-on, the switch is scanned, and when the switch is on, the diagnostic program is initiated in accordance with the setting of SW1-2,3,4.

ON	Diagnostic mode
OFF	Normal operation mode

SW1-8

Used to set the auto cutter YES/NO.

The ON status of the switch indicates that the auto cutter is used. Since the ER-03RP is not provided with an auto cutter, the switch should always be set OFF.

3-2. SW2 (DS2)

SW2-1,2,3,4 Not used. All fixed to ON.

SW2-5

Used to select the SRN transmission speed.

OFF	480 Kbps
ON	1 Mbps

In the normal operation mode (SW1-7 OFF), the switch state is scanned immediately after the master reset has done, and is set in the SRN controller. Master reset must therefore be done when the transmission speed setting is changed.

In the diagnostic mode, the transmission speed is set each time, immediately before the execution of the SRN basic test or the host terminal emulation.

SW2-6,7

Used to set the carrier off monitoring time.

SW2-6	SW2-7	Timer value	
		1 Mbps	480 Kbps
OFF	OFF	6.4mS	12.8mS
ON	OFF	4.8mS	9.6mS
OFF	ON	3.2mS	6.4mS
ON	ON	1.6mS	3.2mS

In the normal operation mode (SW1-7 OFF), the switch is scanned immediately after the master reset has done, and is set in the SRN controller. Master reset must therefore be done when the timer setting is changed.

In the diagnostic mode, the timer is set each time, immediately before the execution of the SRN basic test or the host terminal emulation.

SW2-8

Not used. Fixed to OFF.

3-3. SW3 (DS3)

The dip switch is used to set the SRN terminal address.

In the normal operation mode (SW1-7 OFF), the switch is scanned immediately after the master reset has done, and is set in the SRN controller. Master reset must therefore be done when the address setting is changed.

In the diagnostic mode, the address is set each time, immediately before the execution of the SRN basic test.

Only in the case of executing the host terminal emulation in the diagnostic mode, the address setting by the switch is used as the address of the remote station.

The address is set using a binary number with the SW3-1 setting as the most significant bit and the SW3-8 as the least significant bit.

3-4. Dip switches DS1-DS3 factory setup

SWITCH	Function	Default
SW1-1	CR code (disabled)	OFF
SW1-2	Selection of diagnostic program (line inspection test)	OFF
SW1-3		OFF
SW1-4		OFF
SW1-5		OFF
SW1-6	Selection of conversion type (type 1)	OFF
SW1-7	Diagnostic mode (prohibited)	OFF
SW1-8	Auto cutter (NO)	OFF
SW2-1	Not used Fixed to All "ON".	ON
SW2-2		ON
SW2-3		ON
SW2-4		ON
SW2-5	SRN transmission speed (1M bits)	ON
SW2-6	Carrier off timer (6.4ms)	OFF
SW2-7		OFF
SW2-8	Not used	OFF
SW3-1	Terminal address (00H)	OFF
SW3-2		OFF
SW3-3		OFF
SW3-4		OFF
SW3-5		OFF
SW3-6		OFF
SW3-7		OFF
SW3-8		OFF

4. Disassembly procedure

4-1. Removal of upper cover and bottom cover

- 1) To remove the upper cover, remove the screws M3x6 (at four locations) shown in the figure and unfasten the connector with the upper cover lifted up.
- 2) Remove the screws M3x6 (at four locations) on both sides to remove the bottom cover.

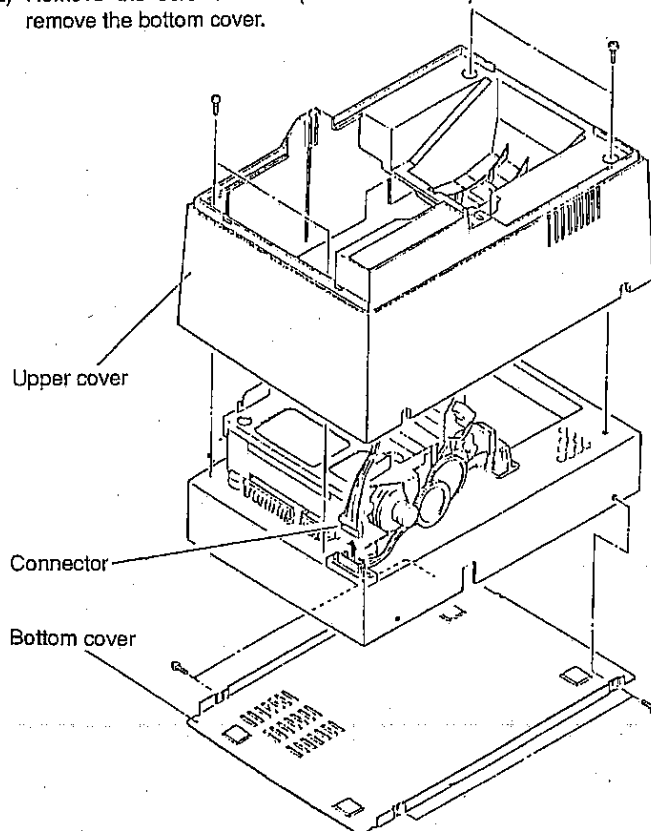


Fig. 4-1

4-2. Removing the printer mechanism

- Remove the upper cover.
- Remove the screws M3x14 (at two locations) shown in the figure.
- Remove the printer mechanism by lifting it up in the arrow direction.

Note: Two washers are provided for the screw in side (A) only.

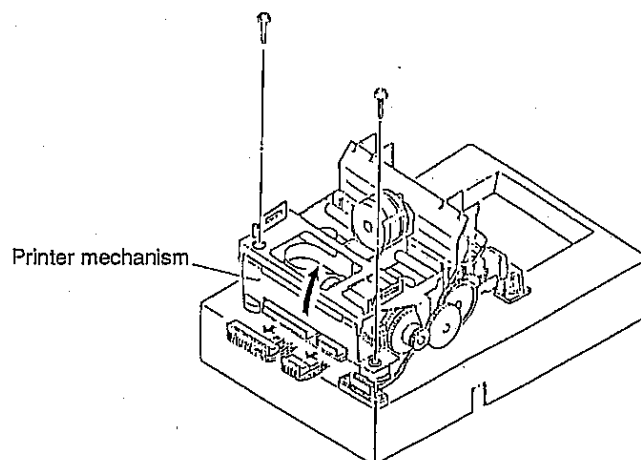


Fig. 4-2

4-3. Removing the control PWB and SRN interface PWB

- Remove the bottom cover.
- Unfasten the connectors (at six locations).
- Remove the PWB holding screws (at four locations) and the connector cover holding screw (at one place) to remove the PWBs.

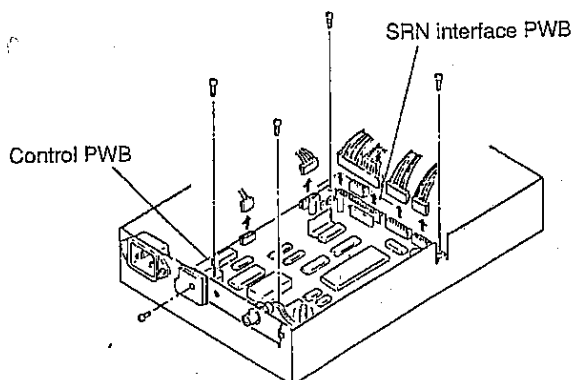


Fig. 4-3

4-4. Removing the power supply PWB and AC power supply unit

- 1) Removing the power supply PWB
 - Unfasten the connectors (at three locations).
 - Remove the screws M3x10 (at two locations) and tapping screws M3x8 (at two locations).
 - Remove the PWB while paying attention to the wires.
- 2) Removing the AC power supply unit
 - Remove the AC inlet holding screws M3x6 (at two locations) and the ground wire holding screw M4x6.
 - Remove the power transformer holding screws M4x6 (at three locations).
 - Unfasten the connector at the secondary side of the power transformer to remove the entire power supply unit.

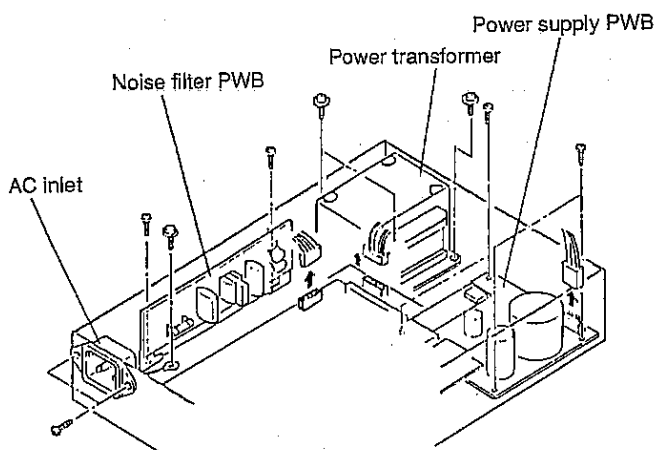


Fig. 4-4

4-5. Removing the operation panel PWB and PE sensor PWB

- Remove the upper cover and the tapping screws (at two locations) to remove the operation panel PWB.
- Remove the printer mechanism and the screw (at one place) to remove the PE sensor PWB and PE sensor holder as an assembly.
To remove the PWB alone, twist the PE sensor holder lug and detach the PWB from the holder.

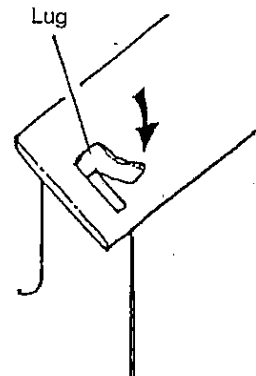


Fig. 4-5

4-6.

When fixing with the switch panel interface connector PWB removed, use fixing screw of 3 x 8. If the any other screw is used, it makes contact with the power PWB.

5. Circuit description

5-1. General

The ER-03RP is a remote printer using the SRN (Sharp Retail Network) as an external interface through which connected to an electronic cash register and a POS terminal. (ER-52BR, 3310, 3311, 3300, 8700, 4100)

The remote printer has a control circuit that consists mainly of a CPU, a ROM, a RAM, and their peripheral circuits, an SRN interface circuit for interfacing with the host, an operation panel circuit for operation switch inputs and LED display, a printer mechanism, and a power supply circuit for supplying necessary power to each circuit.

Fig.5-1 shows a block diagram of the remote printer.

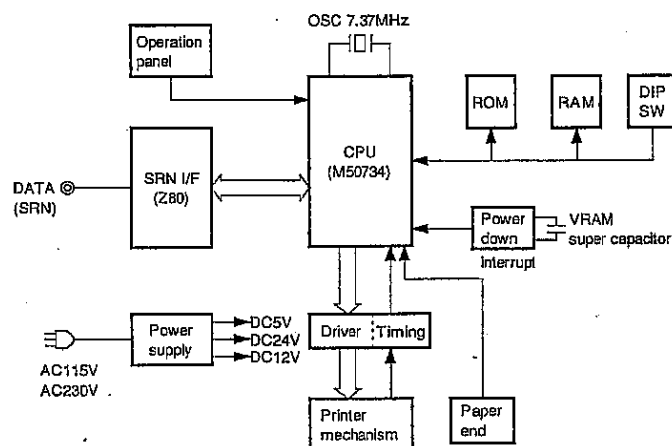


Fig.5-1 ER-03RP block diagram

5-2. SRN control circuit

1) I/O allocation and memory mapping

The CPU used in the SRN control circuit is a single chip 8-bit C-MOS microprocessor with an external memory.

In addition to general purpose I/O ports, the CPU has expansion I/O ports externally allocated on the memory space.

It has an address space of 64K bytes, with a ROM, a RAM, and external expansion I/Os peripherally arranged as shown in the attached page.

The RAM has a capacity of 64K bits or 256K bits according to the destination, the RAM size being checked by software.

Data and control commands are transferred to and from the SRN through the registers in the SRN interface circuit which are allocated on the memory space.

The ROM has a capacity of 256K bits and contains control software and CG data for character printouts.

2) CPU peripheral circuitry

The M50734SP CPU is a CPU with an external memory, and reads the 8 low-order bits of the address through the A0/D0 bus lines from an 8-bit latch HC373.

The ROM has a capacity of 256K bits, and the RAM 64K bits or 256K bits. A super capacitor is used to provide backup power in case of a power failure.

IC9 (74HC00) is also operated on the VRAM power supply for standby control.

A ceramic oscillator is used as the CPU clock to provide a clock frequency of 7.37MHz.

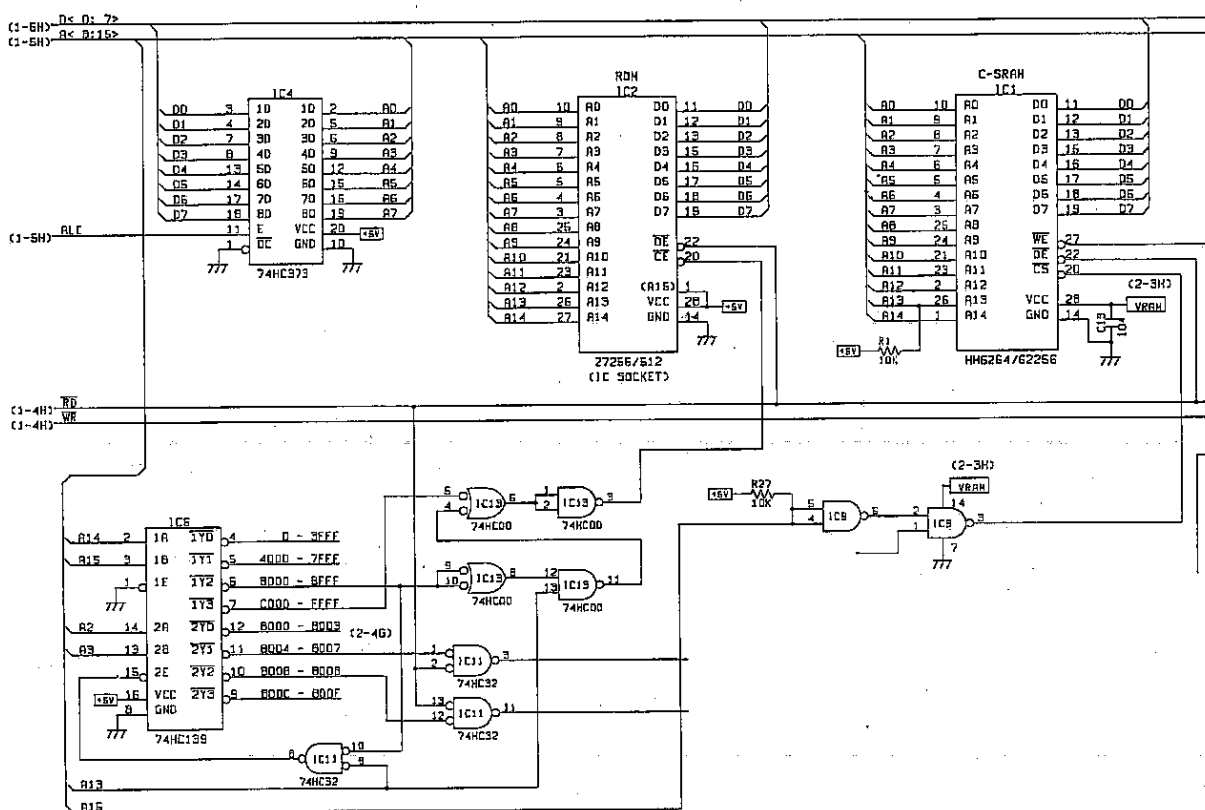


Fig.5-2 ROM/RAM circuits

3) Connection with the SRN interface

The control circuit shares the data bus with the SRN interface circuit, and hardware connection is established between them using \overline{RD} , \overline{WR} , and other control signals.

Logic drive power of +5V and SRN bias voltage of +12V are supplied from the power supply unit.

The SRN interface circuit is not backed up by the VRAM power.

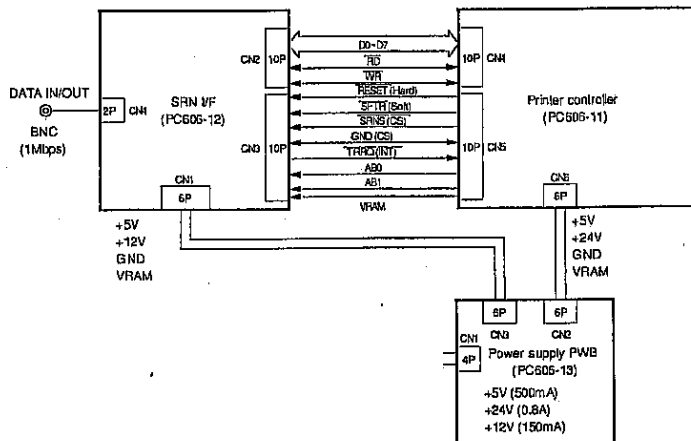


Fig.5-3 SRN interface/printer controller signal diagram

Interface signal description

1. SFTTR

The SRN interface is reset with a low state of signal. The CPU resets the SRN interface any time through the printer controller P03 port.

2. RESET

Reset signal.

This signal is at a high during the power ready state (when $+5V \pm 5\%$ is secured) and low otherwise.

3. RD, WR

Signals for data read/write between the SRN interface and the controller.

4. SRNS

SRN interface select signal

5. D0 ~ D7

Data bus

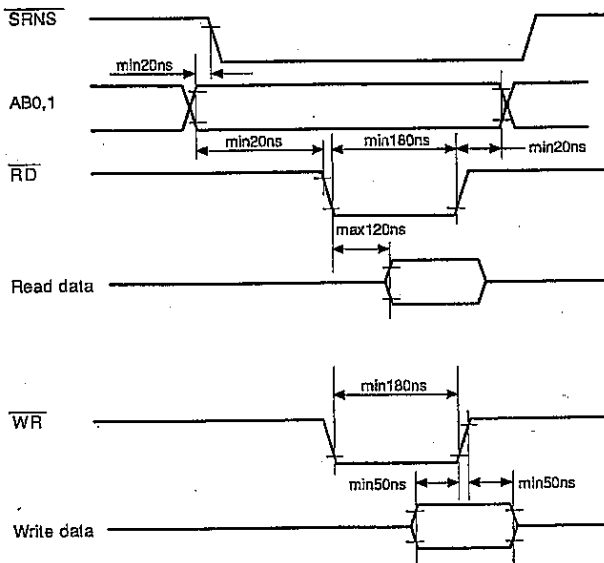
6. TRRQ

Interrupt request signal from the SRN interface to the controller

7. Power supply

+5V : Logic drive power $+5V \pm 5\%$, 250mA

+12V: SRN line bias circuit power $12V \pm 1\%$, 150mA



MB62H149AC gate array timing

Fig.5-4 SRN interface data write/read timings

4) Initial reset and power down interrupt circuit

IC3 is for generating a power down interrupt and a reset signal. When the supply voltage drops due to a power failure or other cause, the circuit works to detect the voltage drop and stores necessary data in the RAM before going into the power down mode.

As shown in the timing chart, when V_{cc} drops to 4.6V at the time of a power failure, the voltage drop is detected, causing the IC to generate a power down interrupt signal, which is sent to the CPU.

In response to the interrupt signal, the CPU issues the data and other necessary information in the buffer to the RAM. This process is completed in about 500msec.

Upon completing the execution of the backup sequence, the CPU sends out signal $\overline{RESET OUT}$ through the port (P37), putting itself in a hardware reset state to prevent it from operating in an unstable condition.

Also, when the power down process is entered, the watchdog timer is cleared, and WD is issued in 4msec, while in about 900msec a power down reset is caused, thus providing a triple fail-safe mechanism.

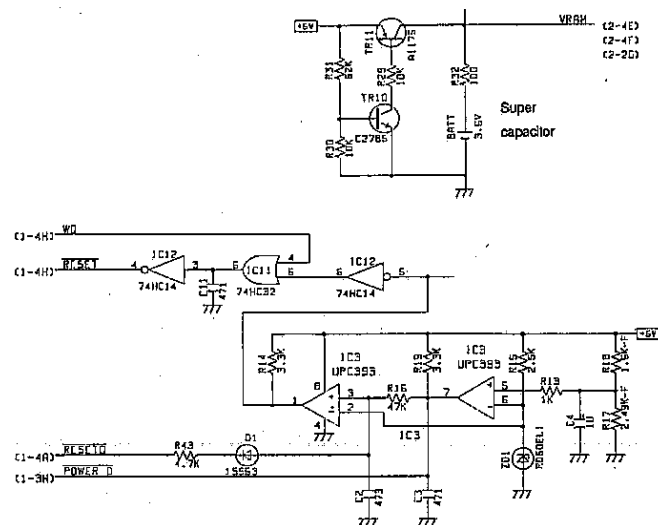


Fig.5-5 Reset and power down interrupt circuit

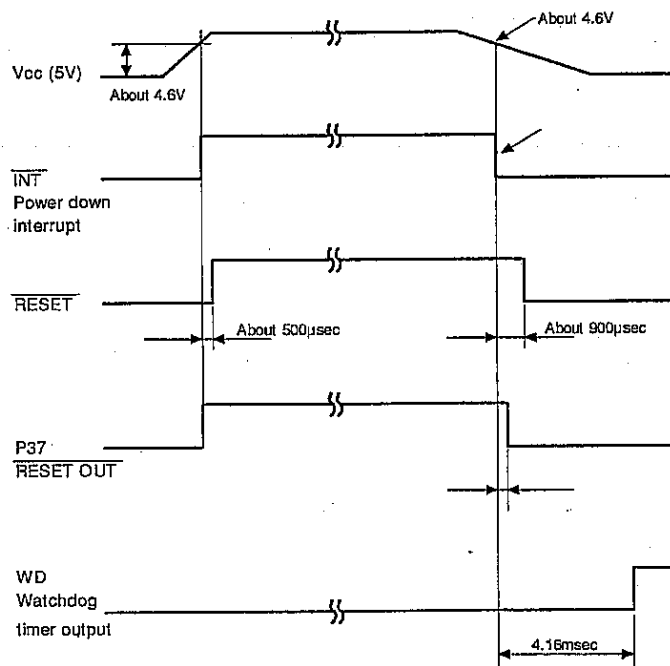


Fig.5-6 Timing chart

5) Printer control circuit

- 1) When a low state of signal through the port P31 of the CPU, the motor starts to run with timing pulses appearing on the DP line of CN5.
- 2) After the motor started, printing takes place in synchronism with the timing that the P port P34 turns from high to low.
- 3) Of nine CPU output ports P20-P29 and P30, a low state of pulse is sent at selected ports, and a character is printed with one energization of the DOT solenoid against two timing pulses.
- 4) Paper feed is done when the port P43 of the CPU goes low at a prescribed timing.
- 5) Color change is performed when the port P32 of the CPU goes low at a prescribed timing.

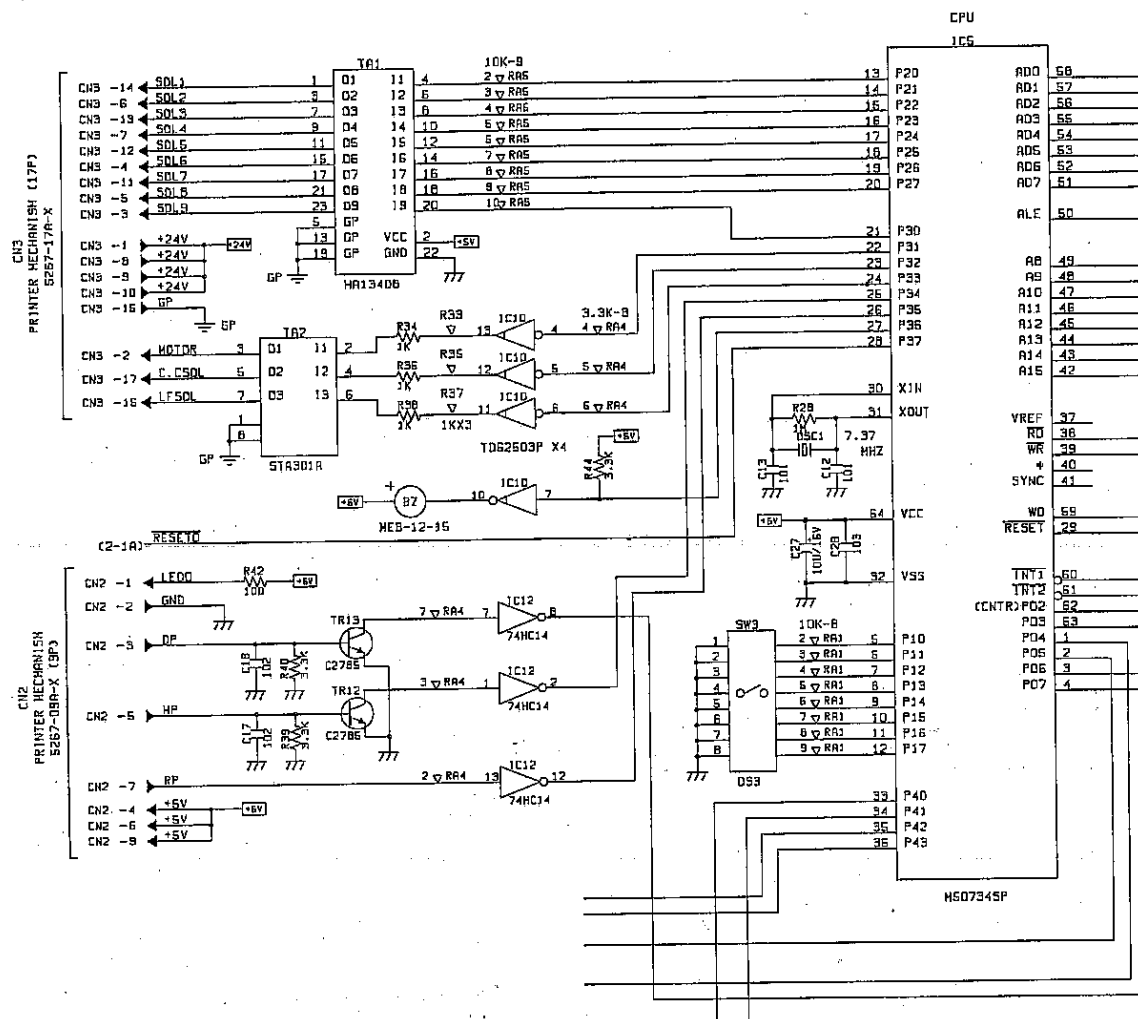


Fig.5-7 Printer control circuit

6) Paper end sensor circuit

Fig.5-8 shows the paper end sensor circuit. A reflection type photointerrupter is used as the sensor. When the paper is present, the light reflected from the paper strikes the phototransistor, therefore, the collector of the phototransistor is at a low. On the other hand, when the paper runs out, since no light is reflected, the collector is at a high, which causes the input port P40 of the CPU to go high, thus informing the paper end state.

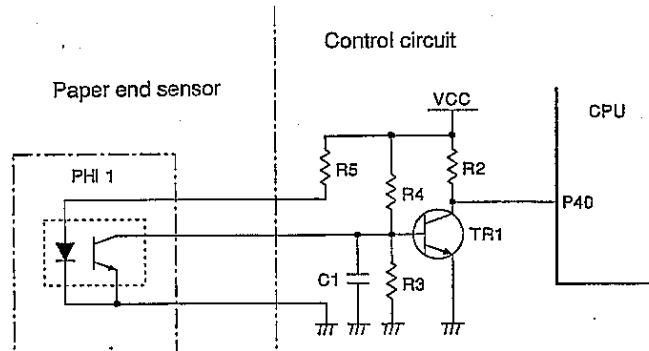


Fig.5-8 Paper end sensor circuit

7) Interface circuit with the operation panel

As shown in Fig.5-9, the operation panel circuit includes switches; an online switch and a line feed switch. The switches are connected to the respective input ports of the CPU, while the LEDs are connected to the output ports through the drivers.

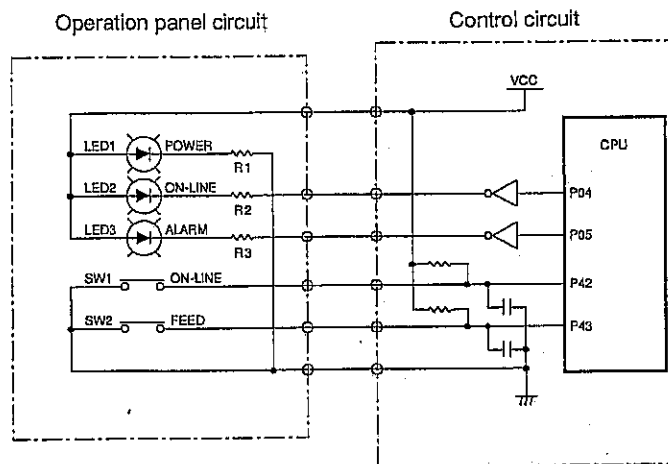


Fig.5-9 Operation panel circuit

5-3. SRN Interface circuit

1) Circuit description

The SRN interface is allocated at the I/O space address, with the printer controller as the host CPU, and transfers data for interfacing using seven interface registers.

Data is transferred to and from the external devices at 1M bps using a coaxial cable. (RG-58U)

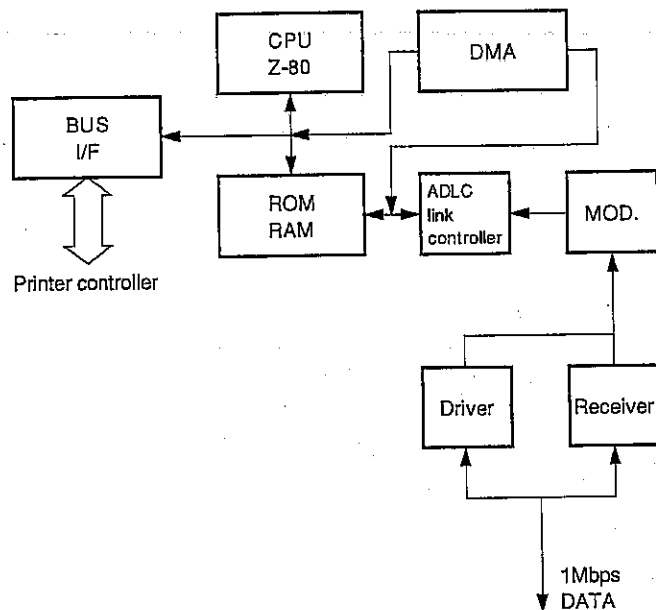


Fig.5-10 SRN interface block diagram

2) Adjustment

The duty adjustment of the interface is carried out in the following manner.

1. Set the oscillator.

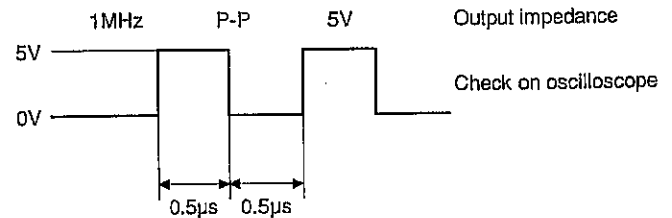


Fig. 5-11

2. Connect a dummy network to the printer. Connect the oscillator and the oscilloscope as shown below.

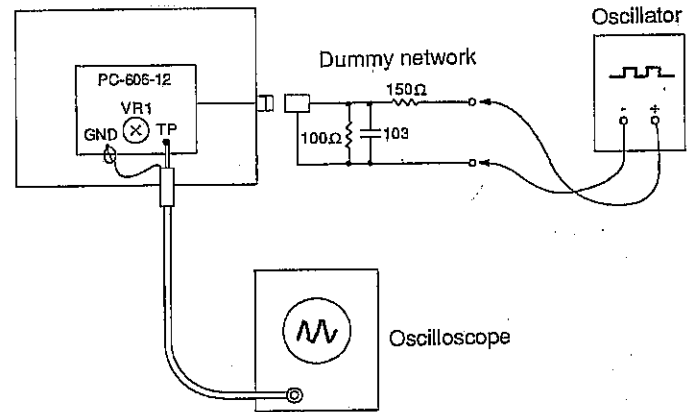


Fig. 5-12

3. Adjust the VR1 5KΩ potentiometer to obtain the following waveform.

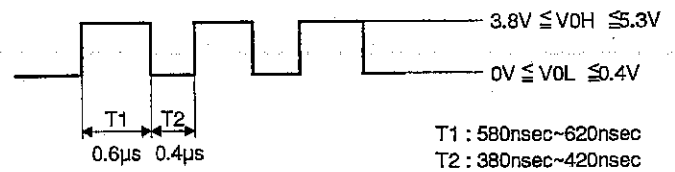


Fig. 5-13

4. Power supply circuit

1) Power supply circuit (secondary side)

This power supply circuit supplies the logic drive power of 5VDC, the printer mechanism drive power of 24VDC, and the SRN interface bias circuit drive power of 12VDC. CN2 is connected to the printer control PWB, and CN3 to the SRN interface PWB.

IC1 is a regulator IC of low saturation voltage type which supplies stabilized +5V power to the circuits.

The 24V power is stabilized by IC2 with the current boosted by transistor Q1.

The +12V power is created from the 24V power using IC3.

The fuse is T1A250V, and protects the 5V power from overcurrent.

2) Noise filter circuit (primary side)

The noise filter circuit uses a common mode type filter to eliminate noise generated from the AC power supply as well as radiation noise from the printer and thus assure stable operation of the printer.

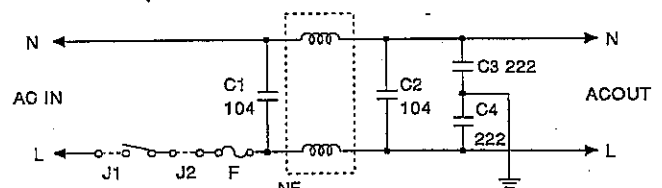


Fig. 5-14

6. Printer unit description

6-1. Hints and tips in handling the printer

6-1-1. Hints in using the printer

- (1) Do not operate the printer when the printer is not loaded with paper and ink ribbon. Printing without paper or ink ribbon will damage the printhead and platen surface, deteriorate the print quality, and shorten the printer life.
- (2) Do not try to move the print head by hand. Since the belt that drives the print head is directly coupled with a gear train, the belt and the carriage drive pipe will be subjected to overload when the print head is moved by hand, leading to timing misalignment and other trouble.
- (3) Since the printer uses a permanent magnet (in the motor) and an electromagnet, avoid using the printer in a location that may be subjected to a large amount of iron filings, dust, dirt, etc.
- (4) Printed circuit boards are mounted in the bottom of the printer. Take care so that the printed circuit boards do not come in contact with the case or foreign materials do not adhere to the boards.

6-1-2. Hints in storing the printer

- (1) Do not store the printer in a location where a large amount of dust or dirt, high temperature, or high humidity is encountered.

6-2. How to load the paper

Use paper of prescribed standard.

6-2-1. Paper lead edge finish

Cut the paper lead edge straight. (See figure below)

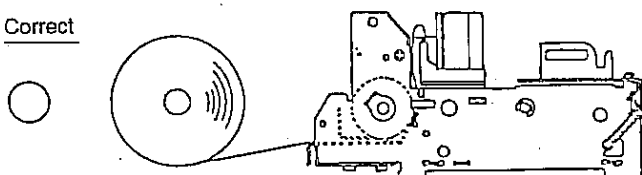
If the paper cannot be smoothly taken up by the paper feed roller, fold back the paper lead edge for ease of insertion.



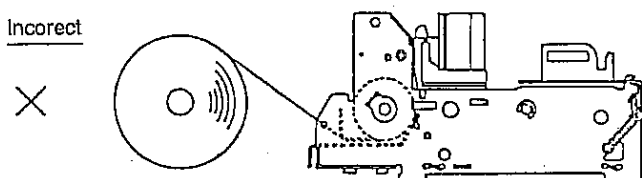
6-2-2. How to load the roll paper

Load the paper as shown below.

Correct



Incorrect



6-2-3. How to load the sprocket paper

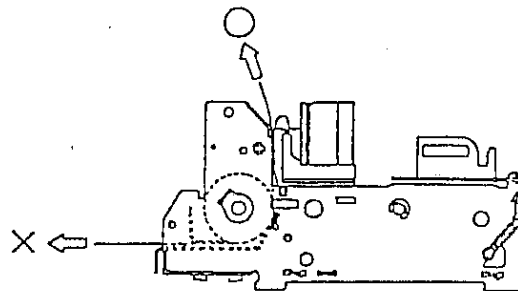
Pull the knob outward and manually rotate the sprocket to load the paper. With the knob pulled outward, the sprocket can be freely rotated.

6-2-4. How to remove the paper from the printer

The paper can be removed from the printer in any of the following methods.

- (1) Pull out the paper upward. (For friction type only)

NOTE: Paper must be pulled straight upward. If pulled slantingly, the paper may become jammed in the printer.



- (2) If the printer is provided with a paper feed knob, pull the knob to release the shaft, and rotate the shaft to eject the paper. (In this case, the paper can be ejected in either direction)
- (3) Eject the paper by electrically operating the printer (pressing the paper feed button with the power ON).

6-3. Hints in using the ribbon cartridge

Use the ribbon cartridge of prescribed specification. If a non-specified ribbon cartridge is used, problems may arise such as malfunctioning of the wire, deterioration of print quality, etc.

6-3-1. How to install the ribbon cartridge

- (1) Tighten the ink ribbon by rotating the ribbon cartridge knob clockwise (arrow direction).
- (2) Fit the ribbon cartridge into the ribbon plate (or frame) with the ribbon inserted between the ribbon mask and the print head.
- (3) After the ribbon cartridge is installed in position, rotate the ribbon cartridge knob once again in the clockwise direction (arrow direction) to remove the slackness in the ribbon.

6-3-2. How to remove the ribbon cartridge

Pull up the ribbon cartridge by holding the right or left side of it. If there is difficulty in removal, push the cartridge to the right or left and unlock the hook on one side before pulling up the cartridge for removal.

6-4. Cleaning

- (1) After using about 10 rolls of paper or after six months of use, clean the printer to remove recording paper dust and dirt. It is desirable to clean by vacuuming (use a vacuum cleaner). Thoroughly clean every part of the printer by vacuuming dust and dirt.
- (2) Use alcohol or benzene to wipe off dirt. Never use thinner, trichlene, or ketone detergents as these may deteriorate or damage the plastic parts.

7. Overview and operating principle of the printer

7-1. Overview

7-1-1. Features

The DP614 printer is a compact serial dot printer, and has the following features.

- (1) Compact, light weight, and low power consumption.
- (2) High speed printing, crisp printing by high reliability 7-pin head, and bidirectional printing method.
- (3) Paper insertion in both directions, from the rear and from the bottom. (for friction type only)

7-1-2. General specification

1. Printing method
Serial impact dot matrix printing method
2. Printing direction
Bi-directional (unidirectional for graphic printing)
3. Printing speed
3.0 lines/sec. $\pm 10\%$
(At motor voltage +25V, +25°C)
4. Print format
 - 1) Character matrix 7x7 (including half dots)
 - 2) Dot composition
180 (360) dots/line
Numbers in parentheses include half dots.
 - 3) Print columns and character size
40 columns 1.4(W) x 2.4(H)mm
5. Color change
Color change is accomplished by energizing the color change solenoid.
 - 1) Voltage: $24 \pm \frac{1}{2}$ VDC
Resistance: $33 \pm 3\Omega$ (25°C)
6. Paper feed
 - 1) Voltage: $24 \pm \frac{1}{2}$ VDC (across solenoid terminals)
Resistance: $33 \pm 3\Omega$ (25°C)
 - 2) Paper feed pitch
4.23mm (1/6")
2.82mm (1/8") for graphic type
 - 3) Quick paper feed Approx. 18 lines/sec.
7. Recording paper
 - 1) Type Friction type: Roll paper
76mm ± 0.5 mm (width)
 $\phi 83$ mm (outer dia.)
Pin wheel type: Fan fold paper
Width 76mm (3") to 89mm (3.5")
 - 2) Kinds of paper Plain paper and non-carbon paper
 - 3) Recommended paper
(Cutform paper) 45-55kg/1000 sheets (1091x788mm/sheet)
(Copy paper) Non-carbon paper
Friction type: One original + one copy
Pin wheel type: One original + two copies
Total thickness 0.2mm max.
8. Inking Special cartridge ribbon, red/black two-color or black monochrome
9. Motor DC brush motor:
Voltage: $24 \pm \frac{1}{2}$ VDC
Current: Peak current Approx. 1A
Average current 0.2A max.
10. Printhead Number of wires: 9
Wire diameter: 0.3mm
Wire pitch: 0.353mm
Solenoid: Voltage 24 ± 1 VDC
Resistance: 17Ω (25°C)

11. Overall dimensions 137(W) x 136(D) x 63.5(H)mm
(5.4"(W) x 5.35"(D) x 2.5(H))
12. Weight Approx. 690g (1.5 lbs)
13. Reliability Printhead life: 50 million characters
Printer mechanism: MCBF 2.5 million lines
14. Operating temperature 0 to +50°C

7-2. Mechanism and operating principle

7-2-1. Outline of mechanism

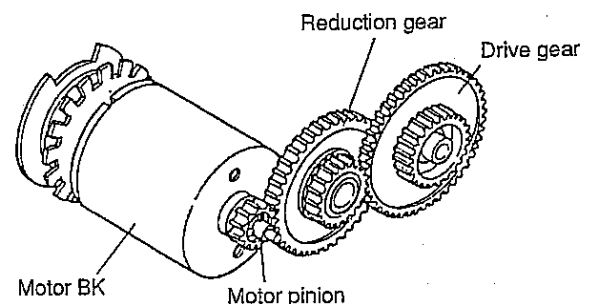
The printer mechanism consists of the following nine blocks.

- (1) Frame block
- (2) Motor block
- (3) Power transmission mechanism block
- (4) Sensor mechanism block
- (5) Head feed mechanism block
- (6) Printhead mechanism block
- (7) Paper feed mechanism block
- (8) Ribbon mechanism block
- (9) Color change mechanism block

7-2-2. Mechanism and operating principle

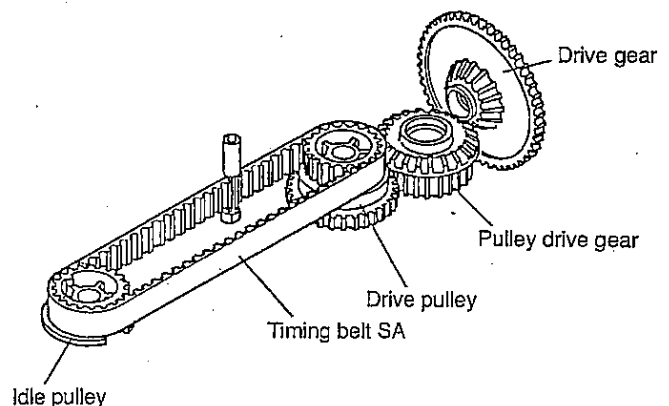
Of the above nine blocks, seven mechanism blocks excluding the frame and motor blocks are described next for their structures and operating principles.

- (1) Power transmission mechanism block
This mechanism block is disposed en bloc on the right side of the printer unit, and consists of a motor pinion fixed to the motor shaft, a reduction gear, and a drive gear, plus four gear trains coupled to the drive gear, i.e. a head feed gear train, a paper feed gear train, a ribbon feed gear train, and a ribbon reset gear train.



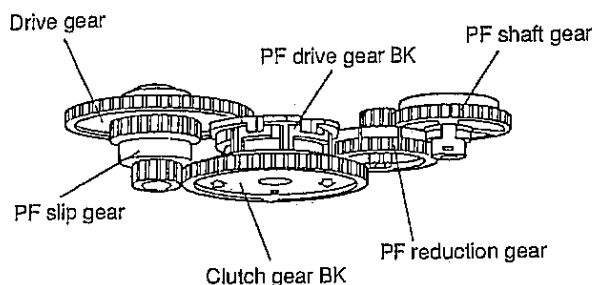
① Head feed gear train

This gear train consists of a pulley drive gear, which is driven by the drive gear, a drive pulley, and an idle pulley. The drive pulley drives a timing belt SA to feed the printhead.



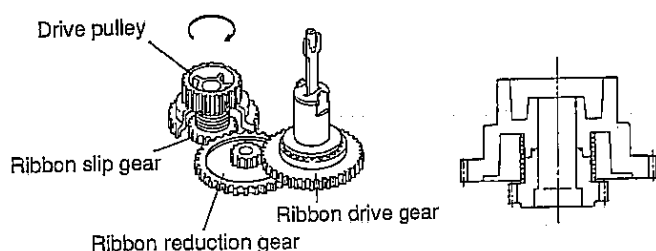
② Paper feed gear train

This gear train consists of a PF slip gear, which is coupled by friction to the drive gear, a PF drive gear BK, which is coupled via a clutch to the drive gear, a clutch gear BK, a PF reduction gear, and a PF shaft gear, to transmit power to the PF shaft.



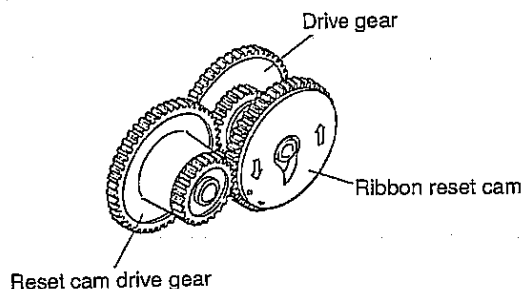
③ Ribbon feed gear train

The gear train consists of a ribbon slip gear, which is coupled by friction to the drive pulley, a ribbon reduction gear, and a ribbon drive gear, and works to continuously take up the ribbon as the motor rotates.



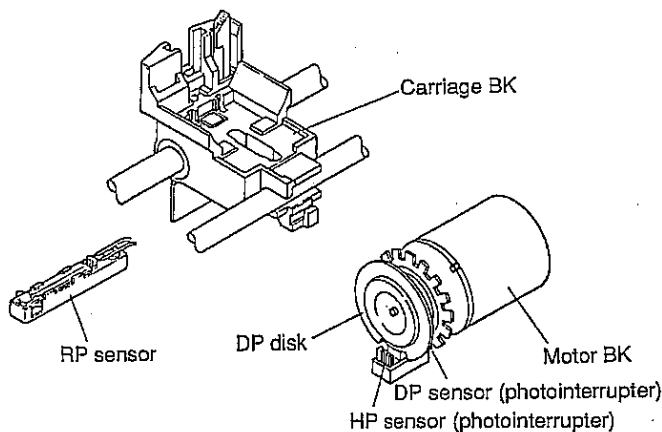
④ Ribbon reset gear train

The gear train consists of a reset cam drive gear, which is driven by the drive gear, and a ribbon reset cam. The ribbon cassette in the red printing position is returned to the black printing position by the rotation of the ribbon reset cam.



(2) Sensor mechanism block

The sensor mechanism block consists of three sensors, i.e. a DP (dot pulse) sensor, a HP (home position) sensor, and an RP (reset pulse) sensor, and plays an important role in the operation and control of printer mechanism parts.



① DP (dot pulse) sensor and HP (home position) sensor

The DP/HP sensor block consists of a dot pulse disk directly coupled to the motor shaft and having equispaced apart 20 slits, a DP disk integrally formed with a home position sensor pulse disk having one slit, and photointerrupters solder bound to the connector PCB SA and corresponding to the respective disks. A pulse is generated as each slit of the disk passes the sensor.

The dot pulse sensor outputs a signal (DP) which is used to control the print solenoid, paper feed, and color change. On the other hand, the home position sensor issues a signal (HP) for every 17 DPs (or 20 DPs), and the signal (HP) is combined with the signal (RP) output from the reset pulse sensor hereinafter described to determine the DP count start position. No waveform shaping circuit is included in the printer, therefore, it is requested that the shaping circuit be provided at the user side.

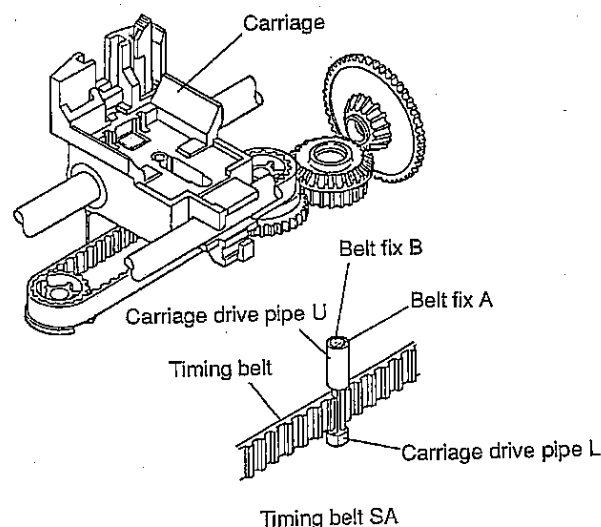
② RP (reset pulse) sensor

The sensor block consists of an RP switch SA which uses a mechanical leaf switch attached on the bottom of the bottom plate BK. As the carriage passes the switch, the actuator is turned on and off to output a signal (RP). The signal RP is used as the home position reference signal.

(3) Head feed mechanism block

The head feed mechanism block consists of the pulley drive gear, which is driven via the drive gear train, the drive pulley, the timing belt SA (comprising a timing belt and a carriage drive pin), the carriage, and the idle pulley. The carriage drive pin consists of belt fixes A/B and carriage drive pipes U and L, and is fixed to the timing belt. When the motor is rotated by a print or paper feed command, the timing belt SA runs in the clockwise direction to horizontally move the carriage with the carriage drive pipe inserted in the elongated groove of the carriage.

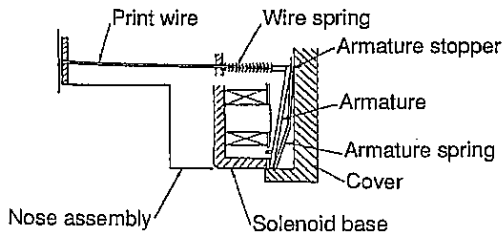
When the printing operation is completed, power is shut off to the motor at a prescribed timing to stop the carriage. At this time, the head stops at approximately the center position.



(4) Printhead mechanism block

The printhead mechanism consists of a nose assembly housing nine wires, a solenoid base comprising solenoids and armatures for driving the wires, and a cover for keeping the armature stroke to a prescribed value.

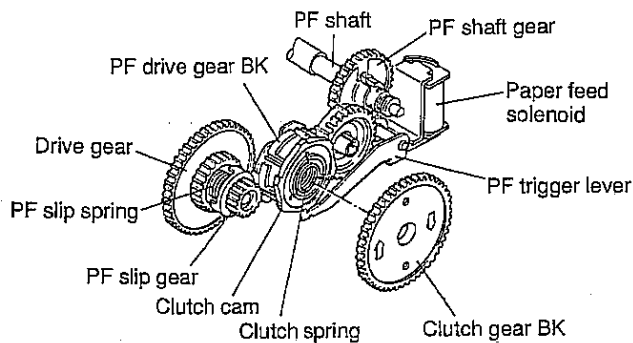
When the selected solenoid is energized for about 450ms in synchronism with the dot pulse, the corresponding armature is pulled into the solenoid. The armature action is transmitted to the corresponding wire, causing the wire to strike the recording paper through the ribbon to produce a dot on it.



(5) Paper feed mechanism

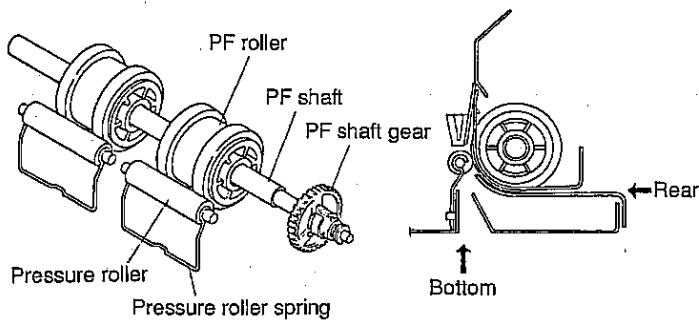
The paper feed mechanism consists of the paper feed power transmission mechanism described in 2-2-2. (1)-(2), a paper feed solenoid which controls the clutch mechanism, a PF trigger lever, and a clutch cam. The PF shaft is driven to feed the paper. The clutch mechanism has a spring clutch, consisting of a PF drive gear BK, a clutch gear BK, a clutch spring, and the clutch cam, to transmit the rotation of the clutch gear BK to the PF drive gear BK.

Two paper feed methods are available for the printer, the friction method and the pin wheel method.



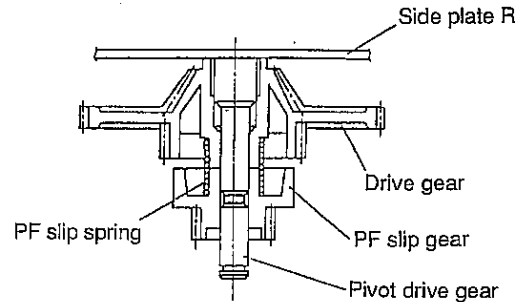
① Friction type (Type D/P61*-F*)

The friction type consists of two PF rollers fixed to the PF shaft, pressure rollers press-contracting the respective PF rollers, and pressure roller springs applying pressure to the respective pressure rollers. Paper is fed by the friction force acting between the PF rollers and the pressure rollers. Paper can be inserted either from the rear or from the bottom.



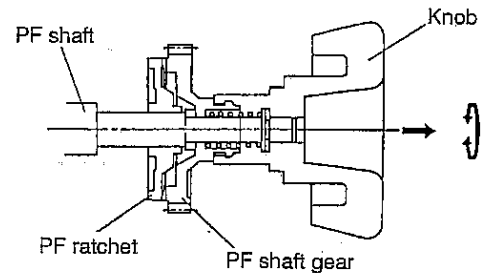
[Paper feed overload protection mechanism]

A safety mechanism is provided to prevent gear breakage and motor coil burning due to the motor seizure in case overload is applied to the PF shaft because of paper jam, etc. The PF slip gear is coupled by friction to the drive gear via the PF slip spring, and is so constructed that when the PF shaft is subjected to a greater load than a prescribed torque, it slips on the PF shaft to absorb the overload.



[Paper release mechanism]

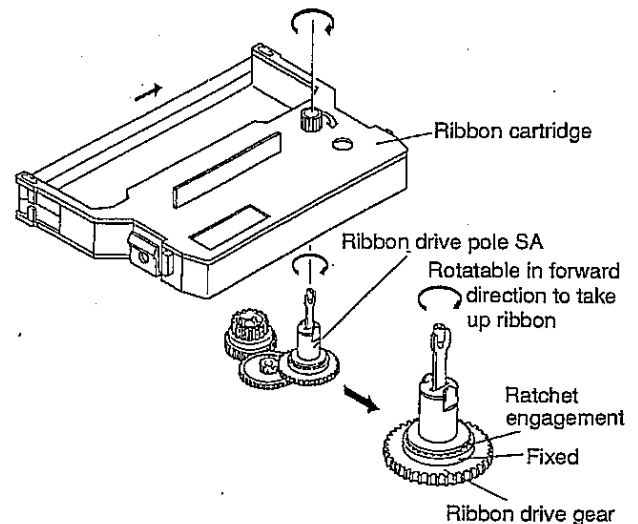
The PF shaft gear is coupled to the PF ratchet fixed to the PF shaft so that the ratchet engagement is released when the paper is pulled in the forward direction, thus allowing the paper to be smoothly pulled out. Also, if a knob is mounted on the PF shaft, the ratchet engagement can be released by pulling the knob outward, thus allowing the PF shaft to be freely rotated. In this situation, the paper can be fed in either forward or reverse directions by rotating the knob.



(6) Ribbon mechanism block

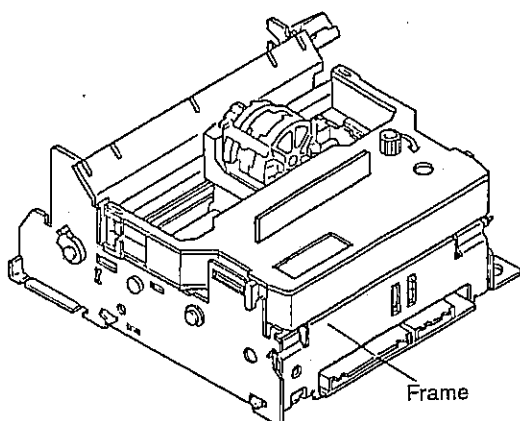
The mechanism block consists of a ribbon cartridge in which an endless ribbon is housed, a ribbon feed gear train, and a ribbon drive pole SA which is driven by the ribbon feed gear train. When the motor is in rotation, the ribbon drive pole SA is continuously rotated via the gear train, to drive the ribbon gear contained in the ribbon cartridge so that the ribbon is continuously taken up.

The ribbon drive pole SA is coupled to the ribbon drive gear via a ratchet, so that it can be rotated freely in the direction in which the ribbon is taken up (in the forward direction). Therefore, the cartridge knob can be rotated to take up the ribbon with the ribbon cartridge installed in the printer.

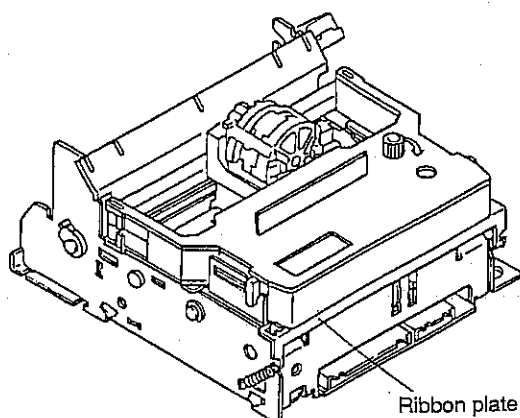


The two-color ribbon cartridge (D type) is mounted on the ribbon plate, and the mono-color type (M type) on the frame.

Mono-color ribbon cartridge mounted in position

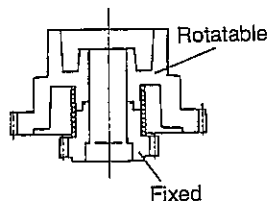
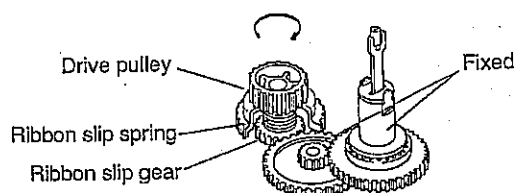


Two-color ribbon cartridge mounted in position



[Safety mechanism]

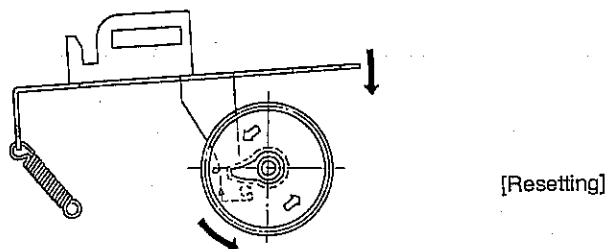
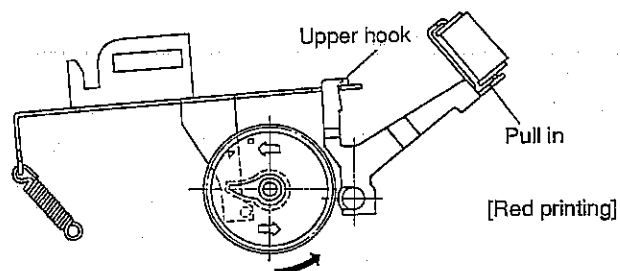
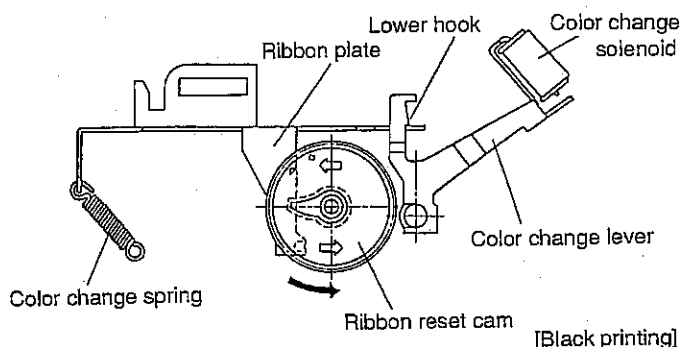
If the ribbon gear binds because of a ribbon jam, the motor may be subjected to overload, causing gear tooth breakage, motor coil burning, and other troubles. To prevent such troubles, the ribbon slip gear is coupled by friction to the drive pulley via the ribbon slip spring, and is so constructed that it slips in the drive pulley when the ribbon feed system is subjected to overload.



(7) Color change mechanism block (for D type only)

The mechanism block consists of a ribbon plate on which to mount a ribbon cartridge, a color change lever, a color change solenoid, a ribbon reset cam, and a reset cam drive gear. In normal operating condition, the ribbon plate is locked in position by the lower hook of the color change lever, holding the black ribbon area in the printing position. When the color change solenoid is energized through a red print command, the color change lever is pulled in to disengage the lower hook from the ribbon plate. The color change lever swings upward by the force of the color change lever, hitting the upper hook of the color change lever. The ribbon plate is thus retained by the upper hook, setting the red ribbon area in the printing position for red printing. When the printing is completed, the ribbon plate is pulled downward by the ribbon reset cam, engaged with the lower hook of the color change lever, and reset to the original position (black printing position).

The timing is so set that the ribbon reset cam will be operated when the printhead is in a non-printing area at the extreme right or left, to avoid accidental resetting during printing.



8. Troubleshooting

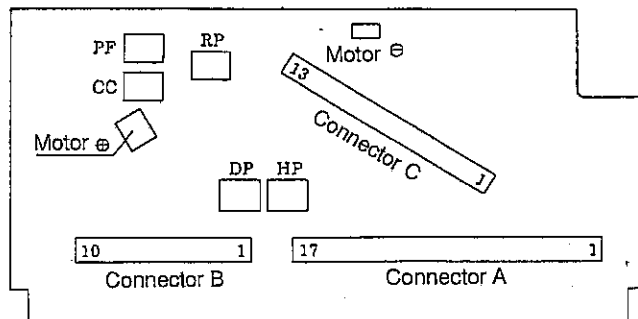
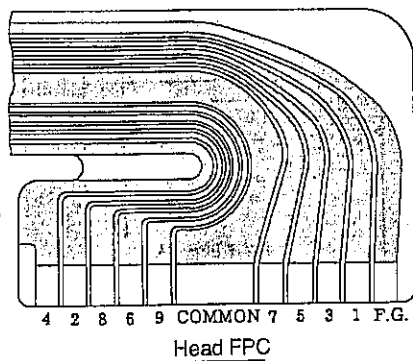
8-1. Repairing procedure

Repairs should be done in accordance with Section 3 "Troubleshooting chart" after acquiring working knowledge of the operating principle and construction of the printer.

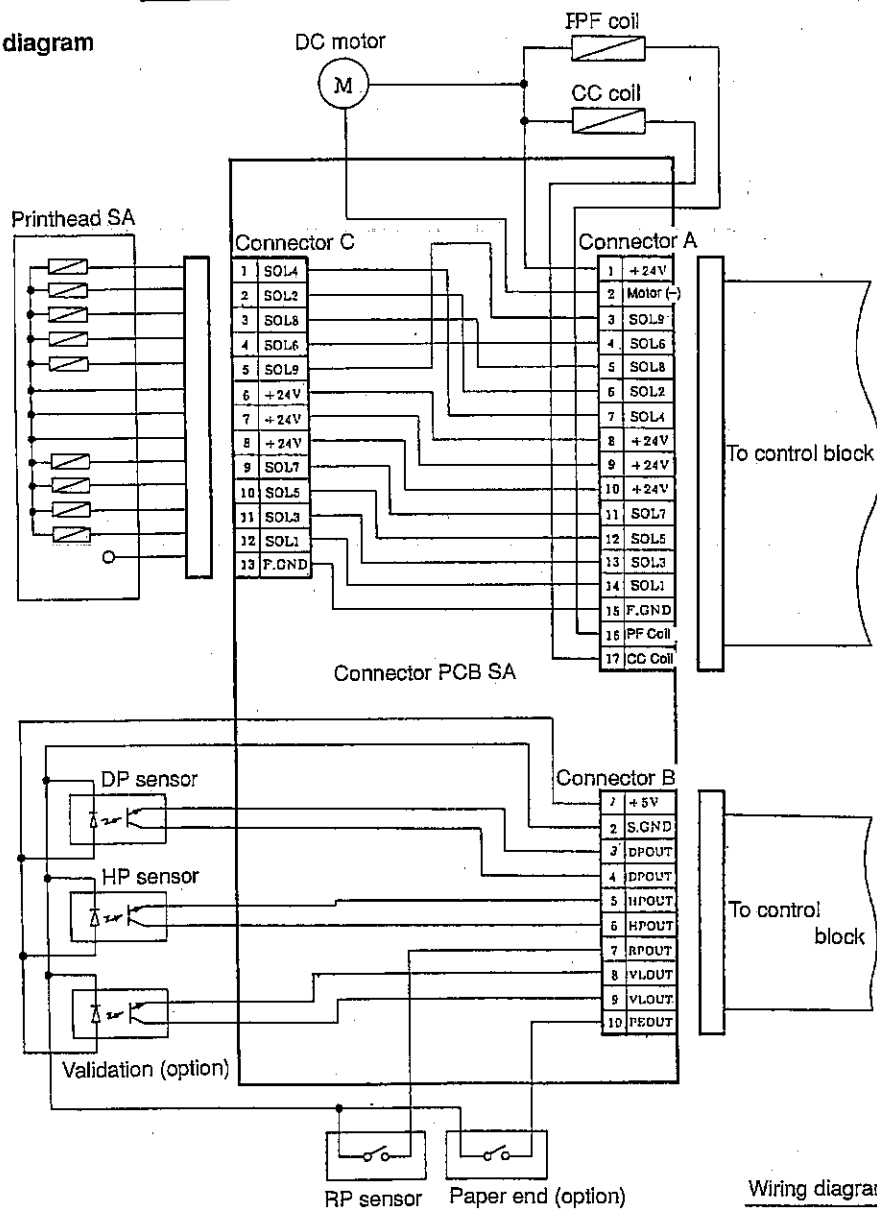
Also refer to 8-2 "Connector and wiring diagrams" which should facilitate the check and repair work.

8-2. Connector and wiring diagrams

8-2-1. Connector diagram



8-2-2. Wiring diagram



Wiring diagram

8-3. Troubleshooting chart

8-3-1. Head feed trouble

Phenomenon	Symptom	Possible cause	Checking procedure	Remedy
Carriage does not move	Motor does not run	Motor defective	Apply rated voltage across soldered motor leads ⊕(red) and ⊖(black) on solder side of connector PCB SA to check if motor runs.	Replace motor.
		Applied voltage to motor not normal	Check voltage across pin 1 (⊕) and pin 2 (⊖) of connector A on connector PCB SA to see if applied voltage is normal.	Repair control block.
		Connector PCB SA defective	Check for continuity between pin 1 of connector A and motor lead (red) and between pin 2 and motor lead (black).	Replace connector PCB SA.
	Motor runs	Paper jam	Remove printhead and check for jammed paper or foreign matter.	Remove foreign matter, etc.
		Printhead wire caught in ink ribbon or paper	Check if wire gets caught.	Replace printhead SA. (Also replace ribbon cassette if wire gets caught in ribbon)
		Foreign matter caught in gear wheel train or broken gear causing action failure	Manually rotate motor pinion to check if gear train moves smoothly.	Remove foreign matter, etc. or replace broken gear.
		Timing belt SA and pulley out of phase	Remove carriage BK and check if carriage drive pin and pulley engagement is not out of phase.	Adjust position of timing belt SA.
		Carriage bearing trouble	Check if carriage rail (front and rear) is lubricated and if carriage rail moves smoothly when turned by hand.	Remove foreign matter, etc. and apply oil, or replace carriage BK and carriage rail.
		DP/HP/RP signal abnormal	Check voltage applied to each sensor and its output waveform. Also check connector PCB SA for continuity.	Repair control block, replace sensor, or replace connector PCB SA.
Carriage does not stop		DP/HP/RP signal abnormal	Check voltage applied to each sensor and its output waveform. Also check connector PCB SA for continuity.	Repair control block, replace sensor, or replace connector PCB SA.
		Trouble in control block	Check hardware circuit in control block and wiring from control block.	Repair control block or rectify wiring.

8-3-2. Printing trouble

Phenomenon	Symptom	Possible cause	Checking procedure	Remedy
Cannot print (all dots or particular dots)	Carriage motion is normal	Head FPC connection failure	Check connection of FPC.	Firmly insert FPC to establish proper connection.
		Printhead SA defective	Replace printhead SA with a new one and check the result.	Replace printhead SA.
		Improper mounting of ink ribbon	Check mounting condition of ribbon.	Mount ink ribbon correctly.
		DP/HP/RP signal abnormal	Check voltage applied to each sensor and its output waveform. Also check connector PCB SA for continuity.	Repair control block, replace sensor, or replace connector PCB SA.
		Trouble in control block	Check hardware circuit in control block and wiring from control block.	Repair control block or rectify wiring.
		Connector PCB SA defective	Check for continuity between connector A and connector B. (Refer to 8-2. Wiring diagram)	Replace connector PCB SA.
		Foreign matter caught in printing area	Remove printhead SA and check printing area for foreign matter.	Remove foreign matter.
		Deformation or improper mounting of ribbon mask	Remove printhead SA and check ribbon mask for deformation and mounting condition.	Replace or properly mount ribbon mask.

Phenomenon	Symptom	Possible cause	Checking procedure	Remedy
Printed characters too light	No ribbon feed	Improper mounting of ribbon cassette	Check mounting condition of ribbon cassette.	Properly mount ribbon cassette.
		Ribbon cassette defective	Rotate ribbon cassette takeup knob in arrow direction to check knob operation and ribbon takeup condition.	Replace ribbon cassette.
		Foreign matter caught in ribbon drive mechanism or broken gear causing action failure	Manually rotate motor pinion in direction toward you to check if gear train moves smoothly.	Remove foreign matter, etc. and replace broken gear.
		Trouble in ribbon slip mechanism	With ribbon cassette mounted in position, manually rotate motor pinion in direction toward you to check if ink ribbon is taken up properly.	Replace ribbon slip mechanism.
	Ribbon feed is normal	Improper gap between printhead and platen	Check gap between printhead and platen.	Adjust gap.
		Trouble in control block	Check voltage applied from control block as well as voltage added time.	Repair control block.
Bi-directional printing misalignment	Misalignment greater than 3.5 columns (17 dots)	Improper mounting position of RP sensor	Try to shift RP sensor mounting position to left or right to check if bidirectional printing misalignment is corrected.	Readjust RP sensor.
	Misalignment inside of 2 dots (misalignment inside of 0.3mm is within specification)	Improper mounting position of connector PCB SA	Try to shift connector PCB SA forward or backward to check if bidirectional printing misalignment is corrected.	Readjust connector PCB SA.

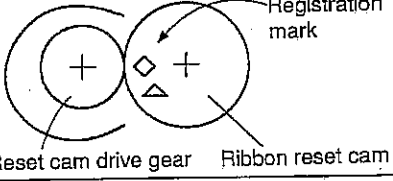
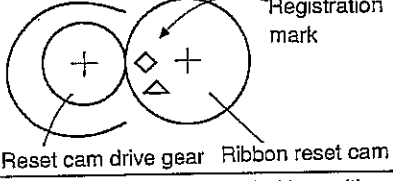
8-3-3. Paper feed trouble

Phenomenon	Symptom	Possible cause	Checking procedure	Remedy
Cannot insert paper		Paper lead edge is bent or improperly cut	Check that paper lead edge is not bent and cut straight.	Insert paper properly once again.
		Trouble because of non-standard paper	Check thickness, width, and diameter of paper used.	Use paper of prescribed specification.
		Trouble because of paper dust or foreign matter	Check paper feed route for dust and foreign matter.	Remove paper dust and foreign matter.
		Improper loading of paper on pin wheels	Check if guide holes of paper are engaged with pin wheels properly (symmetrically and without being stretched too tight or compressed too loose).	Load paper properly.
Paper feed does not operate at all or fails to operate sometimes	PF coil does not pull in	Gap between PF coil and PF trigger lever is too wide	Check gap between PF coil and PF trigger lever.	Readjust gap between PF coil and PF trigger lever.
		PF coil defective	Check resistance of PF coil. (Specification: Approx. 30Ω)	Replace PF coil.
		Connector PCB SA defective	Check for continuity between solder part on connector PCB SA and connector A.	Replace connector PCB SA.
		Trouble in control block	Check hardware circuit in control block and wiring from control block.	Repair control block or rectify wiring.
	PF coil pulls in	Trouble because of paper jam	Check paper feed route and paper loading condition.	Rectify paper feed route and load paper correctly.
		Gap between PF coil and PF trigger lever is too small	Check gap between PF coil and PF trigger lever.	Readjust gap between PF coil and PF trigger lever.
		Trouble in paper feed mechanism	Check if paper feed mechanism has not seized up because of foreign matter or broken gear, or if PF slip mechanism is generating enough force to feed paper.	Remove foreign matter, replace broken gear, or replace PF slip mechanism.
Paper feed pitch improper	Paper feed pitch too great	Trouble in clutch mechanism	Check clutch gear BK, drive gear BK, and clutch spring for abnormal wear and other defects.	Replace defective parts.

8-3-4. Ribbon feed trouble

Phenomenon	Symptom	Possible cause	Checking procedure	Remedy
No ribbon feed		Improper mounting of ribbon cassette	Check mounting condition of ribbon cassette.	Properly mount ribbon cassette.
		Ribbon cassette defective	Rotate ribbon cassette takeup knob in arrow direction to check knob operation and ribbon takeup condition.	Replace ribbon cassette.
		Foreign matter caught in ribbon drive mechanism or broken gear causing action failure	Manually rotate motor pinion in direction toward you to check if gear train moves smoothly.	Remove foreign matter, etc. and replace broken gear.
		Trouble in ribbon slip mechanism	With ribbon cassette mounted in position, manually rotate motor pinion in direction toward you to check if ink ribbon is taken up properly.	Replace ribbon slip mechanism.

8-3-5. Color change trouble

Phenomenon	Symptom	Possible cause	Checking procedure	Remedy
No red printing	No color change	Maladjustment of color change timing	With printhead positioned at extreme left, check if registration mark (◇) on ribbon reset cam is aligned with engaging position with reset cam drive gear. 	Realign registration mark.
		Maladjustment of CC coil gap	With CC lever pulled in CC coil, check gap between ribbon plate and CC lever.	Readjust gap.
		CC coil defective	Check resistance of CC coil. (Specification: Approx. 30Ω)	Replace CC coil.
		Connector PCB SA defective	Check for continuity between solder part on connector PCB SA and connector A.	Replace connector PCB SA.
		Trouble in control block	Check hardware circuit in control block and wiring from control block.	Repair control block and rectify wiring.
Mixed color printing		Maladjustment of color change timing	With printhead positioned at extreme left, check if registration mark (◇) on ribbon reset cam is aligned with engaging position with reset cam drive gear. 	Readjust registration mark.
Mixed color printing		Ribbon mask shape defective	With paper and ribbon loaded in position, carefully move ribbon plate up and down to check if ribbon does not catch ribbon mask.	Replace ribbon mask.
		CC lever operation failure	Check if CC lever operates smoothly.	Replace parts or make corrections.

9. Disassembly and reassembly

Observe the following precautions in maintenance.

PRECAUTIONS

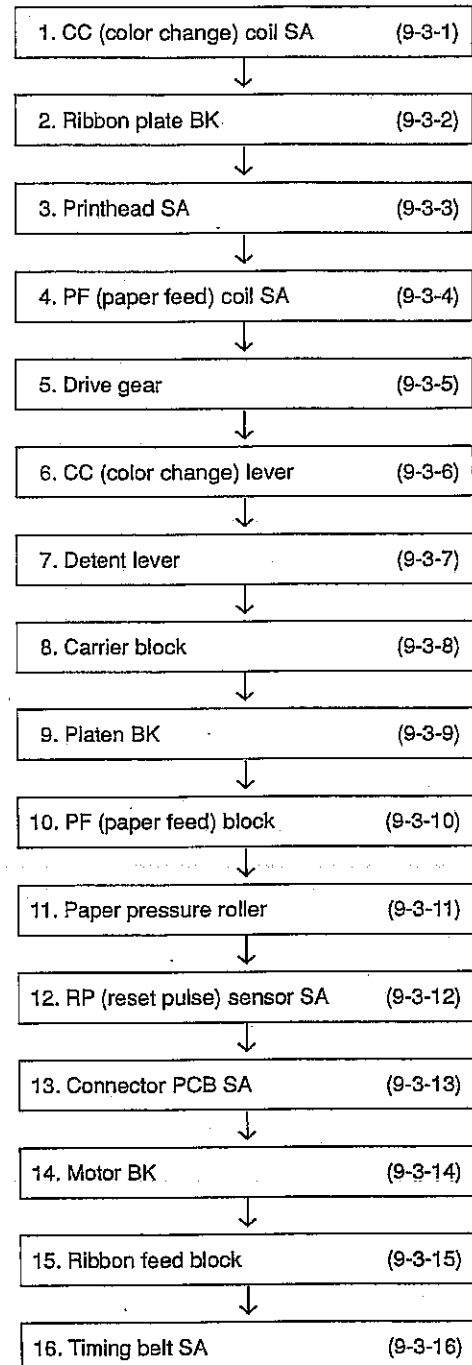
- (1) When the printer is operating satisfactorily, do not try to disassemble, reassemble, or adjust the printer mechanism without proper reasons. Exercise particular care not to loosen the mounting screws on each part by accident.
- (2) After finishing inspection, always check the parts before power-on to confirm that there is no abnormality.
- (3) Never try to print without paper and ribbon loaded in the printer.
- (4) Check that the paper is loaded properly.
- (5) Care must be taken in maintenance so that parts, screws used for maintenance will not be left in the printer.
- (6) When handling printed circuit boards, avoid using gloves that tend to generate static electricity.
- (7) Do not place printed circuit boards directly on the printer or the floor.
- (8) In disassembly and reassembly, check the leads and cords for damage and avoid such wiring as to cause strain to them.

9-1. List of maintenance tools

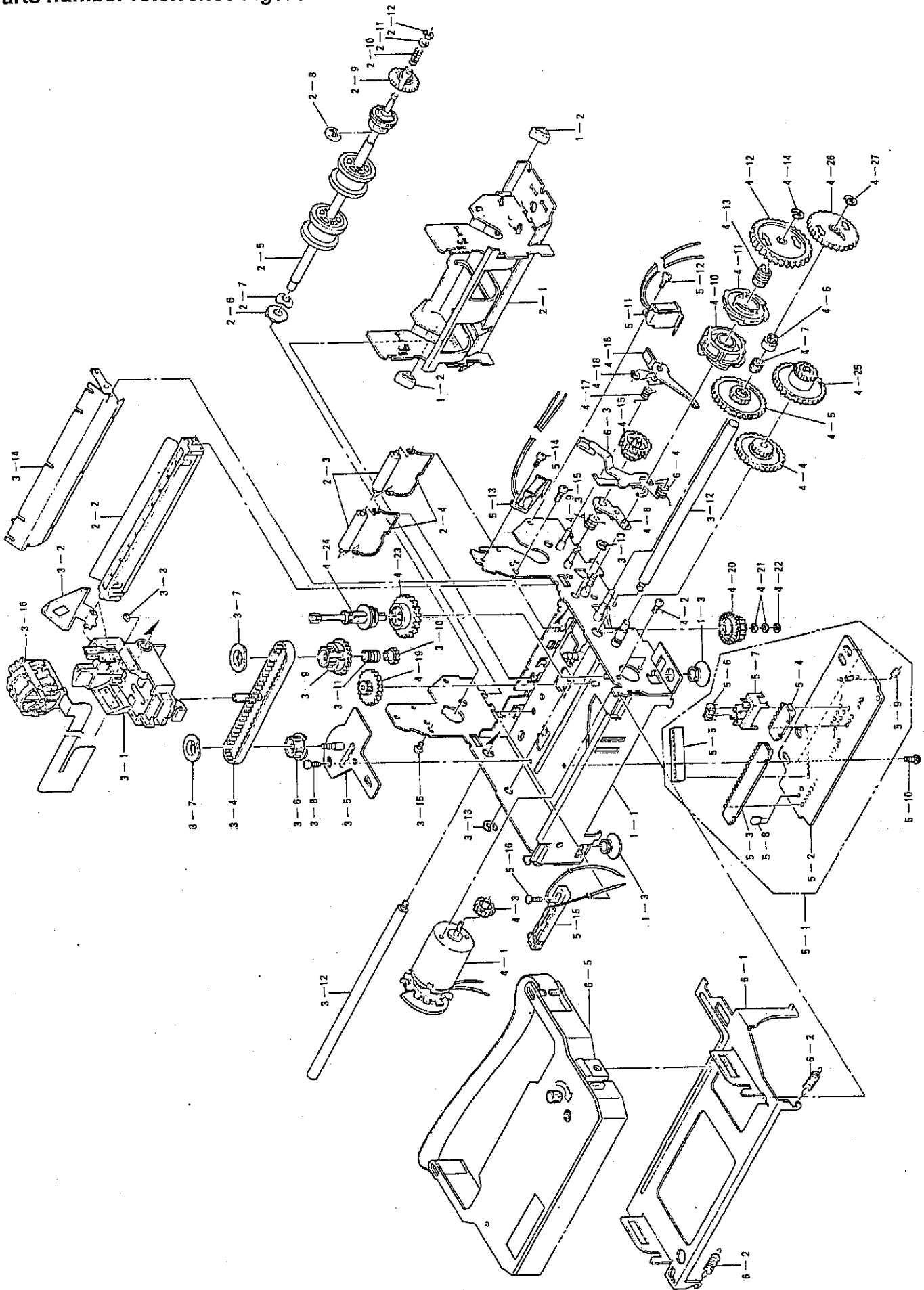
1. Phillips screwdriver (large size) for 3mm size
2. Normal screwdriver (small size)
3. Tweezers
4. Belt tension gauge (dial tension gauge) 100g
5. Scale
6. Soldering pencil
7. Long-nose pliers
8. Thickness gauge (0.5, 0.6mm)
9. Lubricating pen
10. Screw lock paint
11. Oscilloscope

9-2. Disassembly process

Disassemble and reassemble the printer in accordance with the following disassembly procedure.



Parts number reference Figure



9-3. Disassembly/reassembly procedures

Work on disassembly/reassembly of each block in accordance with the disassembly/reassembly flow.

NOTE: Reference numerals used in text

(Example) Connector PCB SA (5-2)

The reference numeral 5-2 indicates the figure number in the attached drawing (Fig. 9-1). Proceed with work by referring to the drawing.

9-3-1. Disassembly/reassembly of CC (color change) coil SA

Tools
Phillips screwdriver
Soldering pencil

[Disassembly procedure]

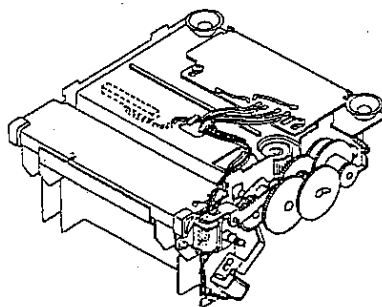
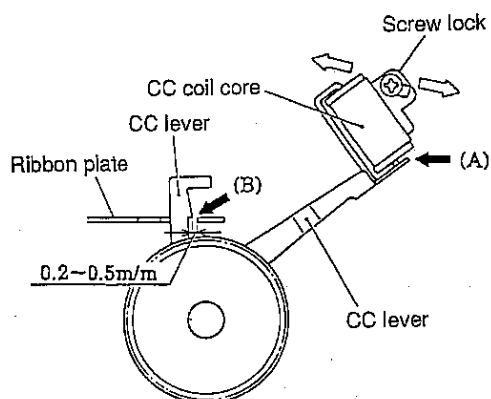
1. Remove the holding screw (5-14).
2. Disengage the cord from the cord holder pawl.
3. Unsoiled the cord from the connector PCB SA (5-2) using the soldering pencil.

[Reassembly procedure]

Reverse the disassembly procedure.
However, the following adjustment is necessary.

ADJUSTMENTS

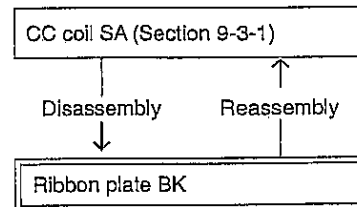
Move the printhead to the center of the carriage rail so that the CC coil core contacts the CC lever as shown by (A) in the figure below. Move the CC coil in directions indicated by arrows ← and → to adjust the clearance between the CC lever and the ribbon plate to 0.2 ~ 0.5mm.



9-3-2. Disassembly/reassembly of ribbon plate BK

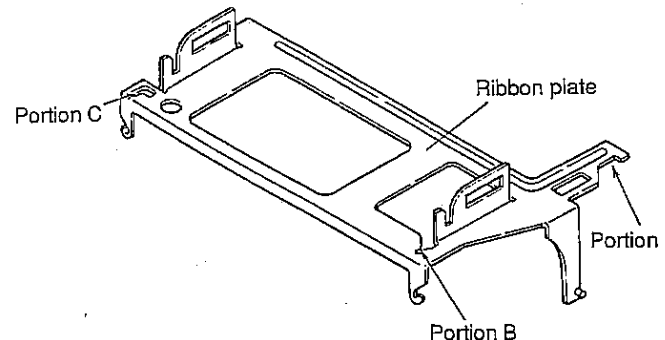
Tools
Phillips screwdriver
Tweezers

[Disassembly/reassembly flow]



[Disassembly procedure]

1. Remove the CC coil holding screw (5-14) to remove the CC coil.
2. Remove the two color change springs (6-2).
3. Disengage the portion A while lifting up the color change lever (6-3), and then, disengage the hinge (portion B) on the right side of the ribbon plate (6-1).



4. Slide the ribbon plate to the right, and disengage the hinge (portion C) on the left side to remove the ribbon plate.

[Reassembly procedure]

Reverse the disassembly procedure.

NOTE: Take care not to deform the ribbon plate BK when reassembling.

9-3-3. Disassembly/reassembly of printhead SA (Refer to drawing for F type)

[Disassembly procedure]

1. Remove the flat cable from the connector. Work is made easier if the flat cable is removed from the end.
2. With the lock lever released, extract the printhead SA (3-16) upward.

[Reassembly procedure]

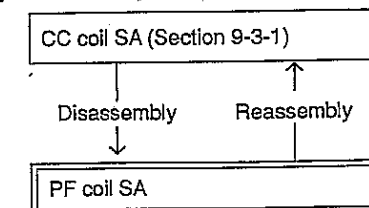
Reverse the disassembly procedure.

NOTE: Check that the flat cable is not in contact with the HP and DP discs.

9-3-4. Disassembly/reassembly of PF (paper feed) coil SA (Refer to drawing for F type)

Tools
Phillips screwdriver
Soldering pencil

[Disassembly/reassembly flow]



[Disassembly procedure]

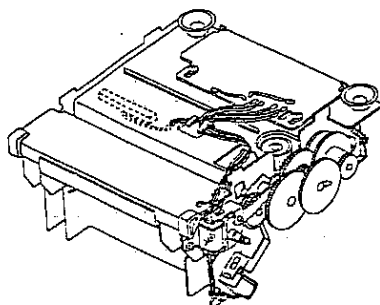
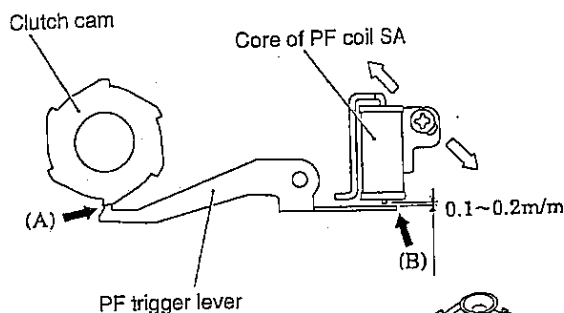
1. Remove the holding screw (5-12).
2. Disengage the cord from the cord holder pawl.
3. Unsolder the cord from the connector PCB SA (5-2) using the soldering pencil.

[Reassembly procedure]

Reverse the disassembly procedure.
However, the following adjustment is necessary.

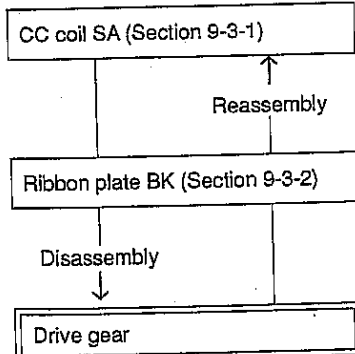
ADJUSTMENT

As shown in the figure below, move the PF coil in directions shown by arrows ← and → to adjust the clearance (B) between the core of the PF coil SA and the PF trigger lever to 0.1 ~ 0.2mm with the tip of the PF trigger lever overriding the clutch cam as shown by (A).



9-3-5. Disassembly/reassembly of drive gear (Refer to drawing for D type)

Tools
Normal screwdriver (small size)
Tweezers

[Disassembly/reassembly flow]**[Disassembly procedure]**

1. Remove the E-ring (4-18).
2. Disengage the hook (frame side) of the PF trigger lever spring (4-17), and remove the PF trigger lever (4-16) and PF trigger spring (4-17).
3. Remove the E-ring (4-27).

4. Remove the ribbon reset cam (4-26).
5. Remove the ribbon reset cam drive gear (4-25).
6. Remove the E-ring (4-14).
7. Remove the clutch gear BK (4-12).
8. Remove the clutch cam (4-11).
9. Remove the clutch spring (4-13) by rotating it counterclockwise.
10. Pry off the PF reduction gear (4-15) with the normal screwdriver.
NOTE: Take care not to ruin the teeth of the PF reduction gear.
11. Remove the PF drive gear (4-10).
12. Remove the drive gear (4-5), PF slip gear (4-6), and PF slip spring (4-7).
13. Remove the reduction gear (4-4).
14. Remove the motor pinion (4-3).

NOTE: The motor pinion is glued to the motor shaft. Remove the motor pinion taking care so as not to bend the motor shaft or ruin the teeth of the motor pinion.

[Reassembly procedure]

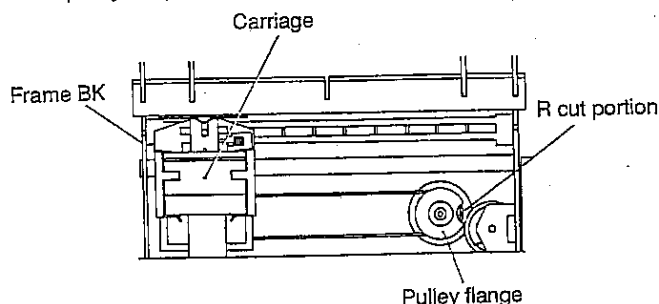
Reverse the reassembly procedure.
However, the following adjustments are necessary.

NOTE 1: Check the backlash amount for engagement of the gears.
NOTE 2: Use screw lock paint to fix the motor pinion in place.

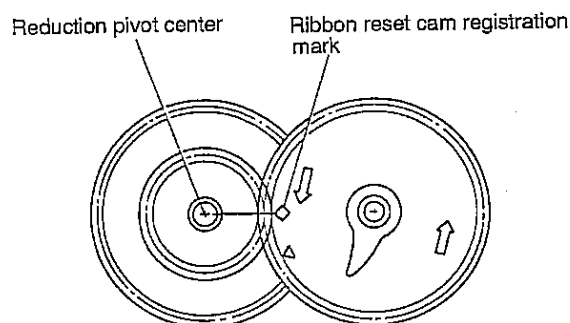
ADJUSTMENT 1

The following adjustment must be made when reassembling the ribbon reset cam. Adjust and assemble in accordance with the following procedure.

- ① As shown in the figure below, move the carriage to the extreme left end of the frame BK by manually rotating the clutch gear. In this situation, adjust the position so that the "R" cut portion on the pulley flange faces to the right.

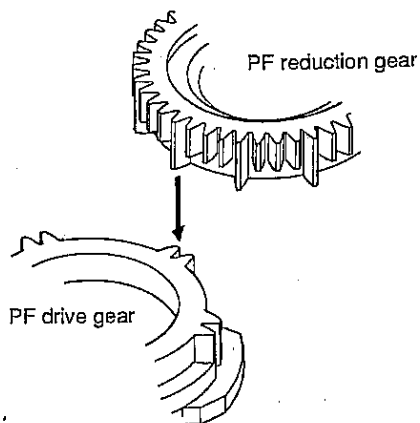


- ② With the position adjusted in the above step ①, reassemble the ribbon reset cam so that the registration mark (◊) on the cam faces the center of the reduction pivot.

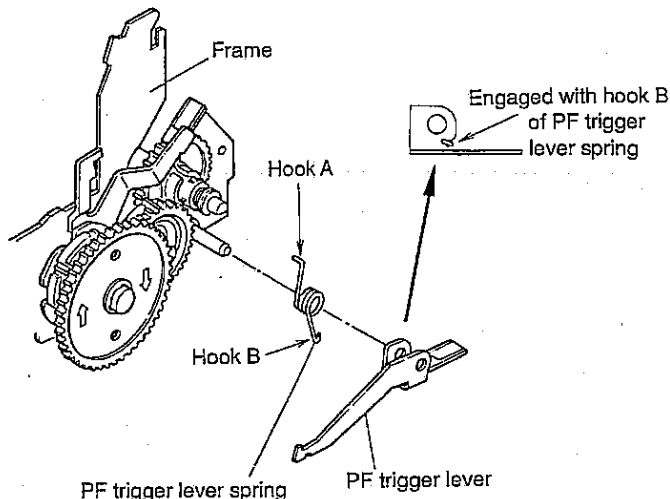


ADJUSTMENT 2

To reassemble the PF reduction gear and the PF drive gear, engage one of the longer teeth of the PF reduction gear with the PF drive gear (as shown by arrow) and push it in until it snaps into place.

**ADJUSTMENT 3**

Reassemble the PF trigger lever with the hook A of the PF trigger lever spring engaged with the frame. Next, engage the hook B of the PF trigger lever spring with the PF trigger lever using tweezers or other appropriate tool.

**ADJUSTMENT 4**

After reassembly, make test printing, and if misalignment is noted in bi-directional printing, make the adjustment in accordance with the following procedure.

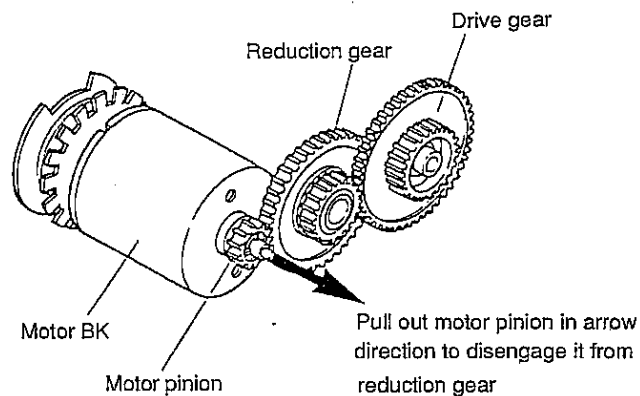
<Procedure>

Adjust the reduction gear engagement with the motor pinion so that no misalignment occurs in bi-directional printing.

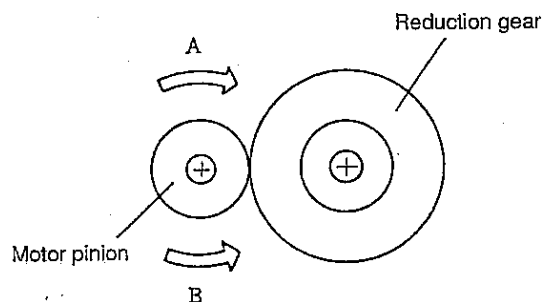
<Method of adjustment>

Make adjustment in accordance with the table and figures below.

Phenomenon	Method of adjustment
	Adjust engagement with the reduction gear by rotating the motor pinion in direction shown by arrow A in the figure below.
	Adjust engagement with the reduction gear by rotating the motor pinion in direction shown by arrow B in the figure below.



Adjusting direction

**9-3-6. Disassembly/reassembly of CC (color change) lever**

Tools
Tweezers

[Disassembly/reassembly flow]

Drive gear (Section 9-3-5)

Disassembly

Reassembly

CC lever

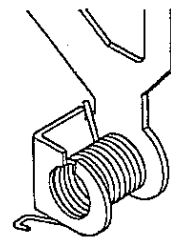
[Disassembly procedure]

1. Disengage the hook of the CC lever spring (6-4) from the frame (1-1).
2. Remove the CC lever (6-3) and CC lever spring (6-4).

[Reassembly procedure]

Reverse the disassembly procedure.

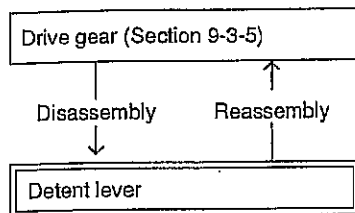
NOTE: As shown below, hook up the CC lever spring to the CC spring retention hole of the frame BK, and check that the CC lever moves lightly with the CC spring force.



9-3-7. Disassembly/reassembly of detent lever

Tools
Tweezers

[Disassembly/reassembly flow]



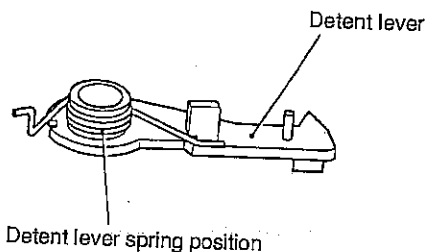
[Disassembly procedure]

1. Disengage the hook of the detent lever spring (4-9) from the frame (1-1).
2. Remove the detent lever (4-8) and spring.

[Reassembly procedure]

Reverse the disassembly procedure.

NOTE 1: As shown below, hook up the detent lever spring to the square spring retention hole of the frame BK, and check that the detent lever moves smoothly.

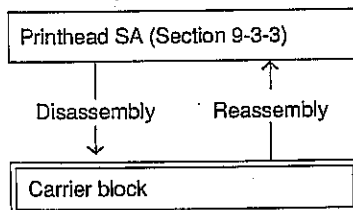


NOTE 2: For graphic type, reassemble the above before reassembling the PF shaft BK.

9-3-8. Disassembly/reassembly of carrier block

Tools
Tweezers
Normal screwdriver

[Disassembly/reassembly flow]



[Disassembly procedure]

1. Move the carriage BK (3-1) to the center of the printer carriage rail, and remove the E-ring holding the carriage rail (3-12) at the platen side.
2. Pull out the carriage rail (3-12) to the left.
3. Remove the carriage BK by lifting up its front side.
4. Remove the E-ring (3-13) holding the carriage rail (3-12) at the motor side.
5. Pull out the carriage rail (3-12) to the right.

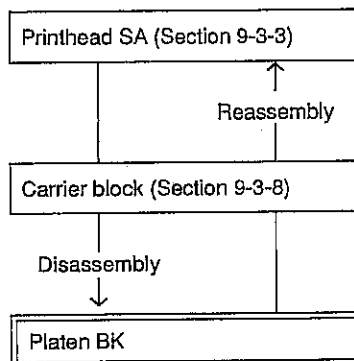
[Reassembly procedure]

Reverse the disassembly procedure.

4-3-9. Disassembly/reassembly of platen BK

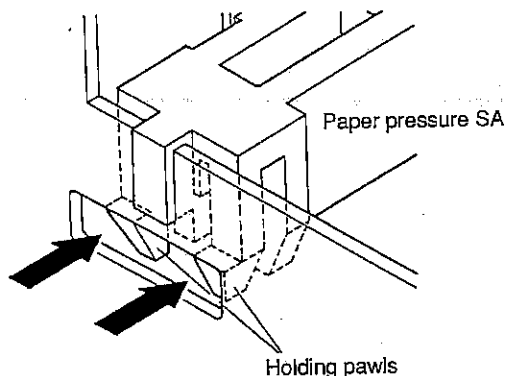
Tools
Phillips screwdriver
Normal screwdriver (small size)
Long-nose pliers
Thickness gauge

[Disassembly/reassembly flow]



[Disassembly procedure]

1. Remove the paper pressure SA (2-2) by pushing the holding pawls in arrow direction using the normal screwdriver.



2. Remove the two holding screws (3-15).
3. Remove the platen BK in frontward direction.

[Reassembly procedure]

Reverse the disassembly procedure.

NOTE 1: Fit the guides of the platen BK onto the projections (on right and left sides) of the side frame to reassemble it in place.

NOTE 2: Set the platen BK in the position where the widest head gap is achieved, and temporarily fix it there with holding screws.

NOTE 3: When reassembling the paper pressure SA into the frame BK, make sure that the holding pawls firmly engage the frame BK.

NOTE 4: Remove the ribbon mask (3-2) before reassembling the carriage BK in position.

The following adjustment is necessary after reassembly.

ADJUSTMENT

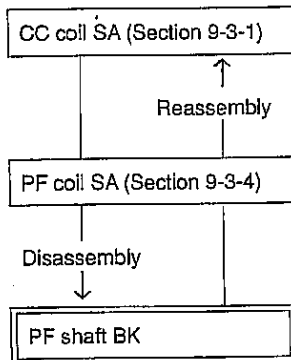
Measure the gap between the printhead and the platen with the thickness gauge, and move the platen BK back and forth to adjust the gap to $0.55\text{mm} \pm 0.05\text{mm}$ at right and left ends as well as at the center.

After the adjustment, tighten the holding screws to firmly fix the platen BK in place.

NOTE: Fit the ribbon mask after the above adjustment.

9-3-10. Disassembly/reassembly of PF (paper feed) block

Tools
Normal screwdriver (small size)
Long-nose pliers
Tweezers

[Disassembly/reassembly flow]**[Disassembly procedure]**

1. Remove the E-ring (2-8) holding the PF shaft BK (2-5).
2. Push the bearings (gearwheel train side) installed on the right and left sides of the frame (1-1) toward the inside to remove the PF shaft BK (2-5), PF shaft washer (2-7), PF shaft bearing (2-6), two pin wheel washers (2-3) (for P type), and two pin wheels (2-13) (for P type).
3. Using the long-nose pliers, unbend the crimped edges (four locations) of the side frames holding the rear plate (2-4) and remove the rear plate (2-4).
4. Remove the pin wheel guides (2-14, 2-15) and the lock levers (2-16, 2-17).

[Reassembly procedure]

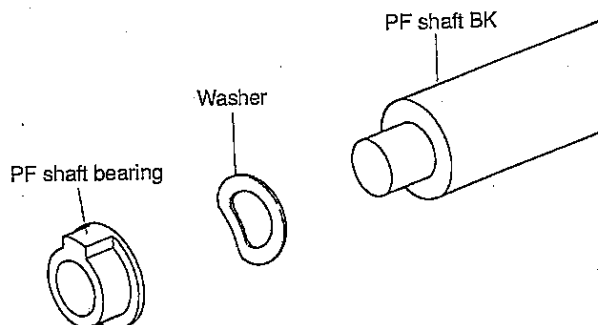
Reverse the disassembly procedure.

NOTE 1: Observe the direction in which to assemble the pin wheel washers. (For P type only)

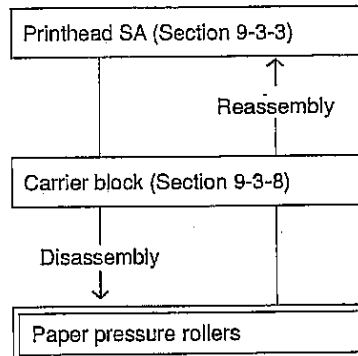
NOTE 2: Install the pin wheels to the PF shaft so that the pins on the right and left pin wheels are aligned with each other.

NOTE 3: Check to ensure that the PF shaft bearings move lightly and smoothly.

NOTE 4: Observe the direction in which to assemble the washers.

**4-3-11. Disassembly/reassembly of paper pressure rollers**

Tools
Tweezers
Normal screwdriver

[Disassembly/reassembly flow]**[Disassembly procedure]**

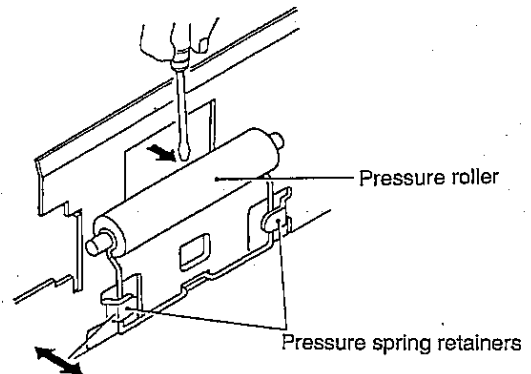
1. Remove the two paper pressure rollers (2-3) from the paper pressure roller springs (2-4) using the tweezers.
2. Insert the normal screwdriver to extract the spring upward.

[Reassembly procedure]

Reverse the disassembly procedure. However, the following adjustment is necessary.

ADJUSTMENT

As shown in the figure below, lightly press the center of the paper pressure roller in the arrow direction using the normal screwdriver to see if the pressure roller moves parallel. If the balance is not good, bend the pressure spring retainers on the bottom plate in the arrow directions (\leftrightarrow) to adjust the balance.



Bend retainers in arrow directions to adjust spring balance.

4-3-12. Disassembly/reassembly of RP sensor SA

Tools
Phillips screwdriver

[Disassembly procedure]

1. Remove the holding screw (5-16).
2. Disengage the cord from the cord holder pawl.
3. Unsolder the cord from the connector PCB SA (5-2) using the soldering pencil.

[Reassembly procedure]

Reverse the disassembly procedure.

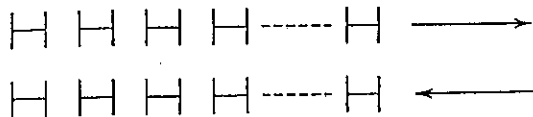
However, the following adjustments are necessary.

ADJUSTMENT 1

Adjustment of bi-directional printing misalignment

<Procedure>

Move the RP sensor SA to the right or left to adjust so that no misalignment occurs in bi-directional printing.

**<Method of adjustment>**

Make the adjustment in accordance with the following table.

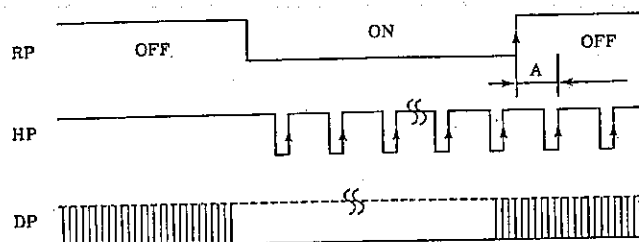
Phenomenon	Method of adjustment
	Move the sensor SA to the right (toward the drive gear).
	Move the sensor SA to the left (toward the home position).

ADJUSTMENT 2

RP/HP waveform adjustment

<Procedure>

Measure the relationship between the RP waveform and the HP waveform on the oscilloscope when bi-directional printing is made.

**<Check points>**

RP waveform — Pin ⑦ of connector CNB
 HP waveform — Pin ⑥ of connector CNB
 GND — Pin ② of connector CNB

<Method of adjustment>

Make the adjustment in accordance with the following table.

Value of A	Method of adjustment
5ms and lower	Move the sensor SA to the left (toward the home position).
5 ~ 8ms	No adjustment necessary
8ms and over	Move the sensor SA to the right (toward the drive gear).

<Check>

After the adjustment, check to ensure that no misalignment occurs in bi-directional printing.

9-3-13. Disassembly/reassembly of connector PWB SA

Tools
 Phillips screwdriver
 Soldering pencil

[Disassembly procedure]

1. Unsolder the red and black motor leads from the connector PWB SA (5-2) using the soldering pencil.
2. Remove two holding screws (5-10).
3. Remove the connector PCB SA (5-2).

[Reassembly procedure]

Reverse the disassembly procedure.

However, the following adjustments are necessary.

BEFORE OPERATIONS

Replacement of diode (for printing speed adjustment) on PWB

<Procedure>

Make sure to replace the diode with a new one when the PWB is replaced.

NOTE 1: If this procedure is not observed, it may not be possible to satisfy the specification with regard to the printing speed.

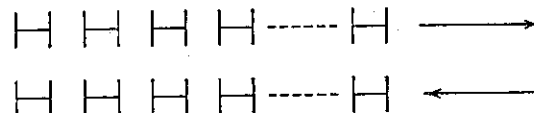
NOTE 2: Observe the polarity of the diode.

ADJUSTMENT 1

Adjustment of bi-directional printing misalignment

<Procedure>

Move the connector PWB SA back and forth to adjust so that no misalignment occurs in bi-directional printing.

**<Method of adjustment>**

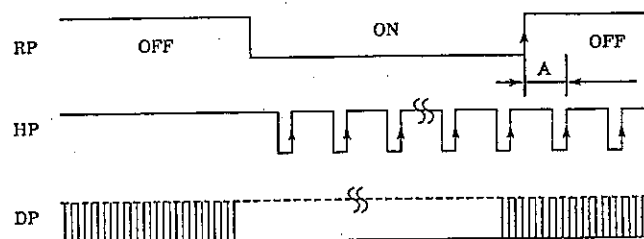
Phenomenon	Method of adjustment
	Move the PWB SA forward (toward the platen).
	Move the PWB SA rearward (away from the platen).

ADJUSTMENT 2

RP/HP waveform adjustment

<Procedure>

Measure the relationship between the RP waveform and the HP waveform on the oscilloscope when bi-directional printing is made.

**<Check points>**

RP waveform — Pin ⑦ of connector CNB
 HP waveform — Pin ⑥ of connector CNB
 GND — Pin ② of connector CNB

<Method of adjustment>

Value of A	Method of adjustment
5ms and lower	Move the PCB SA forward (toward the platen).
5 – 8ms	No adjustment necessary
8ms and over	Move the PCB SA rearward (away from the platen).

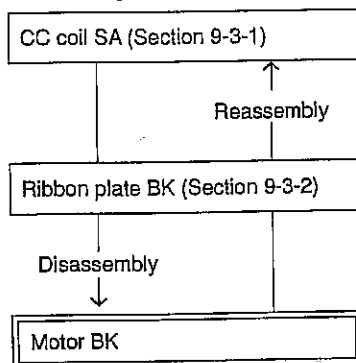
<Check 1> After the adjustment, check to ensure that no misalignment occurs in bidirectional printing.

<Check 2> Check to ensure that the flat cable is not in contact with the HP and DP disks when the printhead SA is moved to the extreme right end.

9-3-14. Disassembly/reassembly of motor BK

Tools
Normal screwdriver (small size)

[Disassembly/reassembly flow]



[Disassembly procedure]

1. Remove two holding screws (4-2).
2. Remove the motor BK (4-1).

[Reassembly procedure]

Reverse the disassembly procedure.

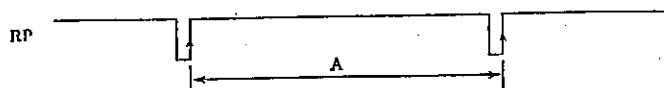
NOTE: Use screw lock paint to fix the motor pinion in place.
However, the following adjustment is necessary.

ADJUSTMENT

Printing speed adjustment

<Procedure>

Measure the cycle A of the RP waveform on the oscilloscope when bi-directional printing is made.



<Check points>

RP waveform — Pin ⑦ of connector CNB
GND — Pin ② of connector CNB

NOTE: Make the adjustment under the following conditions.

- ① Ribbon cassette: Loaded
- ② Paper: Loaded
- ③ Motor driving voltage: +24V±0
- ④ Ambient temperature: Room temperature
- ⑤ Continuous printing

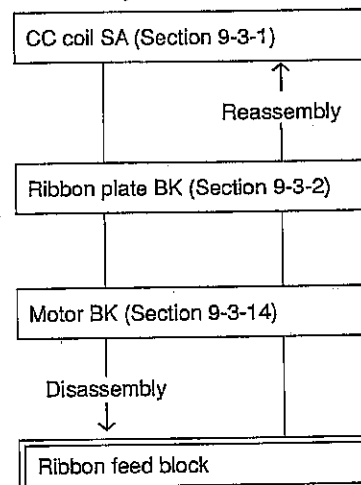
<Method of adjustment>

Adjust the diode (for printing speed adjustment) on the connector PCB SA so that the cycle A comes within the range shown in the table below.

Model	Value of A	Method of adjustment
DP-610	500ms ~ 555ms	Value of A is smaller than the specified range: Use diode of greater capacity.
DP-612	602ms ~ 634ms	
DP-614	649ms ~ 794ms	Value of A is greater than the specified range: Use diode of smaller capacity.
DP-617	844ms ~ 925ms	

9-3-15. Disassembly/reassembly of ribbon feed block

[Disassembly/reassembly flow]



[Disassembly procedure]

1. Extract the ribbon drive pole SA (4-24) upward.
2. Extract the ribbon drive gear (4-23).

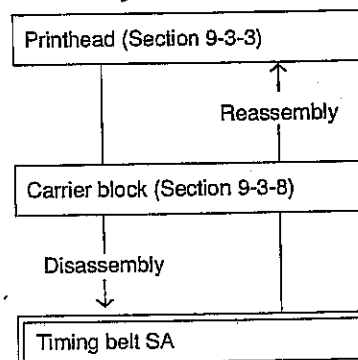
[Reassembly procedure]

Reverse the disassembly procedure.

9-3-16. Disassembly/reassembly of timing belt SA

Tools
Phillips screwdriver
Normal screwdriver (small size)
Tweezers
Tension gauge
Scale

[Disassembly/reassembly flow]



[Disassembly procedure]

1. Remove the E-ring (4-22).
2. Remove one or two adjust washers (4-21).
3. Remove the pulley drive gear (4-20).
4. Remove the two pulley flanges (3-7) by spreading them outwardly.
5. Remove the timing belt SA (3-4), idle pulley (3-6), drive pulley (3-9), ribbon slip gear (3-10), and ribbon slip spring (3-11).
6. Remove the ribbon reduction gear (4-19).
7. Remove the screw (3-8) (M3x4) holding idle pulley plate BK.
8. Remove the idle pulley plate BK (3-5).

[Reassembly procedure]

Reverse the disassembly procedure.

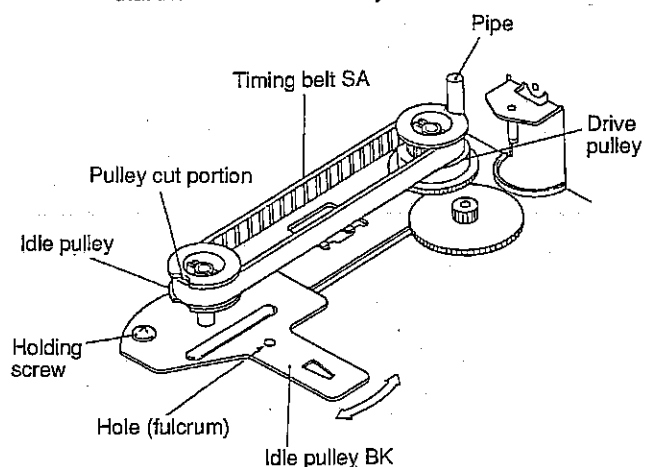
NOTE 1: Installation of idle pulley BK

Temporarily fix the idle pulley BK with the holding screw (M3x4) after ensuring that the projection on the frame SA is fitted into the hole of the idle pulley BK.

NOTE 2: Installation of timing belt SA

As shown in the figure below, position the idle pulley and the drive pulley with their cut portions facing outward, and install the pipe of the timing belt SA by fitting it onto the cut portion. The pipe must be installed with its longer portion pointing up.

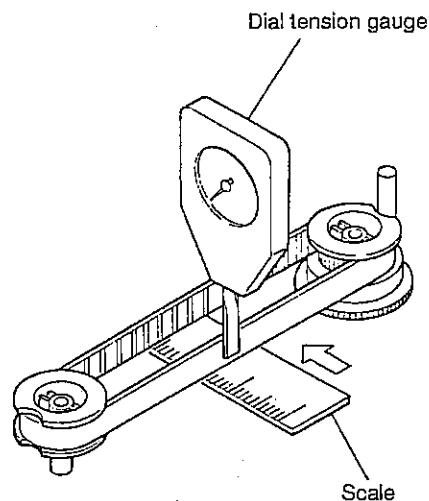
After installation, rotate the timing belt in one turn to ensure that the belt moves smoothly.

**ADJUSTMENT**

- Adjustment of timing belt tension

With the pipe of the timing belt SA fitted onto the cut portion (see the figure below), apply load to the center of the timing belt. Adjust the belt tension by moving the idle pulley BK so that the portion of the belt on which the dial tension gauge is pressed sags 1mm when a pushing force of 40g is applied.

After the adjustment, tighten the holding screw tightly.

**9-4. Lubrication****9-4-1. Lubrication time**

Since the printer is maintenance free, lubrication is not necessary in usual use of the printer. However, lubrication is necessary at the time of disassembly, reassembly, and cleaning of the printer.

9-2-2. Kinds of oil

- | | | |
|----------------------|--------|--------------------|
| (1) Multemp PS.No.1 | | Maker: Kyodo Yushi |
| (2) Floil 946P | | Maker: Kanto Kasei |
| (3) Epinoc Grease AP | | Nippon Oil |

9-4-3. Oil quantity

- | | | |
|-------------------|--------|--|
| Large quantity | | Generous amount |
| Adequate quantity | | Approx. 3 to 4 drops. Approx. 0.2mm thickness in the case of grease. |
| Small quantity | | Approx. 1 drop. Approx. 0.1mm thickness in the case of grease. |

9-4-4. Lubricating spots

Refer to the attached drawing and the lubrication table on the following page.

9-4-5. Lubrication table ... Also refer to the attached drawing for D type.

Arrow number	Lubricating spot	Kinds of oil	Oil quantity	Lubrication time	Notes
1	4-16 Mounting pivot	Multemp	Adequate	At replacement	
2	4-8, 4-15 Mounting pivot	Multemp	Adequate	At replacement	
3	4-10, 4-11, 4-12, 6-3 Mounting pivot	Multemp	Adequate	At replacement	
4	4-5, 4-6, 4-7, 4-26 Mounting pivot	Multemp	Adequate	At replacement	
5	4-4, 4-25 Mounting pivot	Multemp	Adequate	At replacement	
6	4-20 Mounting pivot	Multemp	Adequate	At replacement	
7	4-19 Mounting pivot	Multemp	Adequate	At replacement	
8	4-23, 4-24 Mounting pivot	Multemp	Adequate	At replacement	
9	4-26 Cam on reverse side	Multemp	Adequate	At replacement	
10	4-10, 4-12, 4-13 Joint (3 locations)	Epinoc	Large	At replacement	
11	4-11 Circumference	Multemp	Adequate	At replacement	
12	4-5, 4-6, 4-7 Joint (3 locations)	Multemp	Large	At replacement	
13	3-12 Surface	Multemp	Adequate	At replacement	
14	3-3. Entire face	Floil 946P	Large	At replacement and cleaning	
15	3-4 Carriage drive pipe surface	Multemp	Small	At replacement	Do not apply to timing belt.
16	4-23 Inside (ratchet)	Multemp	Adequate	At replacement	
17	3-9, 3-10, 3-11 Joint (3 locations)	Multemp	Large	At replacement	
18	3-6, 3-7 Mounting pivot	Multemp	Adequate	At replacement	
19	2-5 Bearing mount and PF ratchet (3 locations)	Multemp	Adequate	At replacement	
20	6-1 Sliding portion (4 locations)	Multemp	Adequate	At replacement	



10. Test function (SW1-7: ON)

To execute the test function, first turn power off, set the switch SW1-7 to ON, and then turn power on. The operation initiates the execution of the test as set by SW1-2, SW1-3, and SW1-4.

10-1. ROM/RAM test (SW1-2:ON, SW1-3:ON, SW1-4:ON)

A sum check of the ROM and a read-after-write test on a particular area of the RAM are performed.

The RAM is tested with respect to the command/data buffer area.

80H bit shift pattern is used as the write data.

(80H → 40H → 20H 01H → 80H)

After the test is completed, the following printout is produced.

The sum data and the version of the ROM are printed out.

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4

```
ROM TEST OK 24 18 VER. 1.0
RAM TEST OK (3 2KB)
(Paper feed)
```

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4

```
ROM TEST NG FFE3 VER. 1.0
RAM TEST NG ( 8KB)
(Paper feed)
```

The RAM size varies according to the destination.

The RAM size is checked upon power-on to automatically set 8KB or 32KB whichever used.

The RAM size type is printed starting on the 13th column on the RAM test result print line.

After the printing is completed, the buffer area is initialized.

For the RAM verify test, 64 bytes of object codes on the ROM is transferred to a particular area on the RAM.

10-2. Host terminal emulation mode (SW1-2:OFF, SW1-3:ON, SW1-4:ON)

The SW3 status is read, and with the read value as the receiving station address, a printout command/data packet is created and transferred to the remote station. At this time, the transmitting station address remains as previously set.

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4

```
SRN TEST FROM 1BH TO 2CH
```

Printout on transmitting station printer (black printing)

Printout on receiving station printer by printout packet from transmitting station

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4

```
SRN SEND TEST FROM 1BH TO 2CH 0001
```

Black printing

Counter

Receiving station address

Transmitting station address

One packet is carried on one line, and a flag is set on the final packet. If a transmit error status is returned from the SRN interface, the data will be re-transmitted. If the transmission failed at the third try, the status returned from the SRN interface will be printed out to terminate the test.

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2

```
SRN STATUS 10010000 COMMAND 11H
```

Black printing

Status

Identification code of command that caused error

When ACK or NAK is returned, the following printout is produced.

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5

```
RS1 = 00H RS2 = 99H
```

Black printing

(RS1 is the 28th byte of status information, and RS2 the 29th byte)

When the above printout is produced, the counter is incremented and the next packet is transmitted. The interval between packets is about 3 seconds.

10-3. RAM verify (SW1-2:ON, SW1-3:OFF, SW1-4:ON)

At the end of 7-1. ROM/RAM test, the copy data in the verify area is compared with the original ROM data, and the result is printed out.

1 2 3 4 5 6 7 8 9 0 1 2 3

```
RAM VERIFY OK
```

Black printing

Or

1 2 3 4 5 6 7 8 9 0 1 2 3

```
RAM VERIFY OK
```

Black printing

10-4. Dip switch read test (SW1-2:OFF, SW1-3:OFF, SW1-4:ON)

The switch values are read and printed out.

1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5

```
SW1 ON ON ON ON OFF ON ON ON
SW2 ON ON ON ON ON ON ON ON
SW3 OFF OFF OFF OFF OFF ON ON ON
```

10-5. Printout test (SW1-2:ON, SW1-3:ON, SW1-4:OFF)

All internal character codes are printed in a black matrix pattern at a time. After that, a partial cut is performed, and the same content as the first ones are printed out in red.

The above cycle of operation is repeated endlessly.

The program can be terminated only by turning power off.

10-6. SRN flag continuous transmission (SW1-2:OFF, SW1-3:ON, SW1-4:OFF)

The SRN interface is reset, and the flag pattern continuous transmission diagnostic (diagnostic 3) is carried out. No printout operation is performed in this test.

The program can be terminated only by turning power off.

10-7. SRN packet continuous transmission (SW1-2:ON, SW1-3:OFF, SW1-4:OFF)

The SRN interface is reset, and the packet continuous transmission diagnostic (diagnostic 4) is carried out. No printout operation is performed in this test.

The program can be terminated only by turning power off.

7-8. Line inspection program (SW1-2:OFF, SW1-3:OFF, SW1-4:OFF)

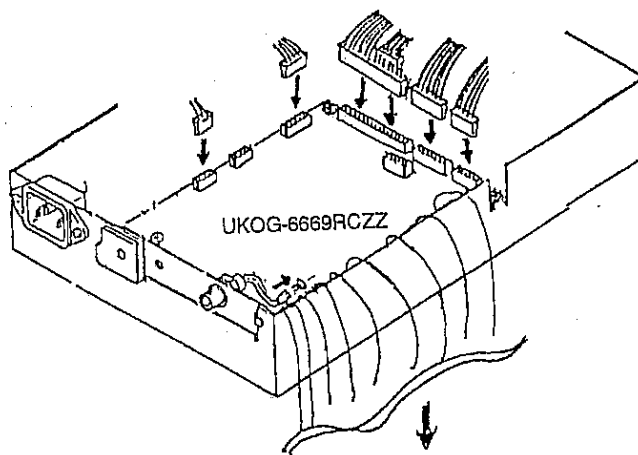
The diagnostic programs of the printer are sequentially performed to test the hardware functions.

(Test sequence)

- (1) Printout test
- (2) Dip switch read test
- (3) ROM/RAM test
- (4) Host terminal emulation mode

The line inspection program can be terminated by turning power off. Host terminal emulation mode (4) is continuously performed until the power is turned off.

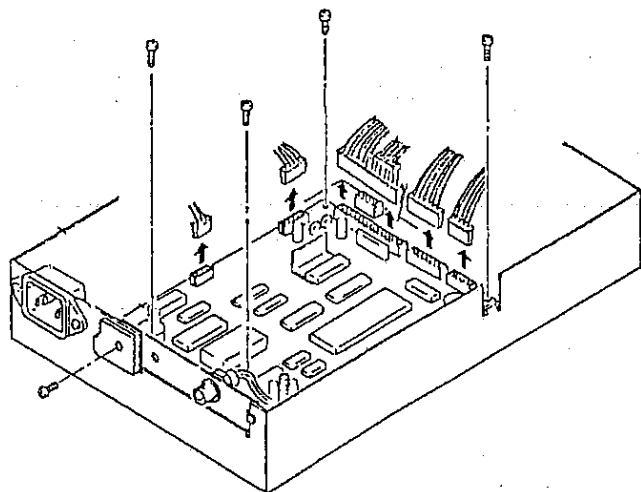
- 5) Insert the connectors (which were disconnected in procedure 1)) to the UKOG-6669RCZZ.



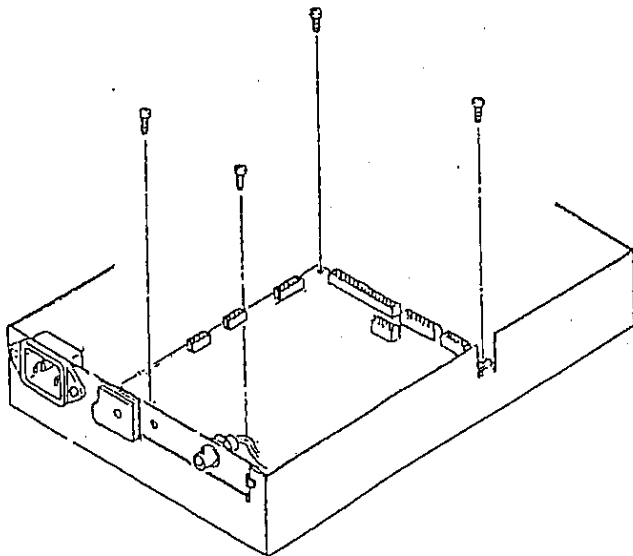
11. Special service tool

11-1. Disassembly of the control PWB and the SRN interface PWB

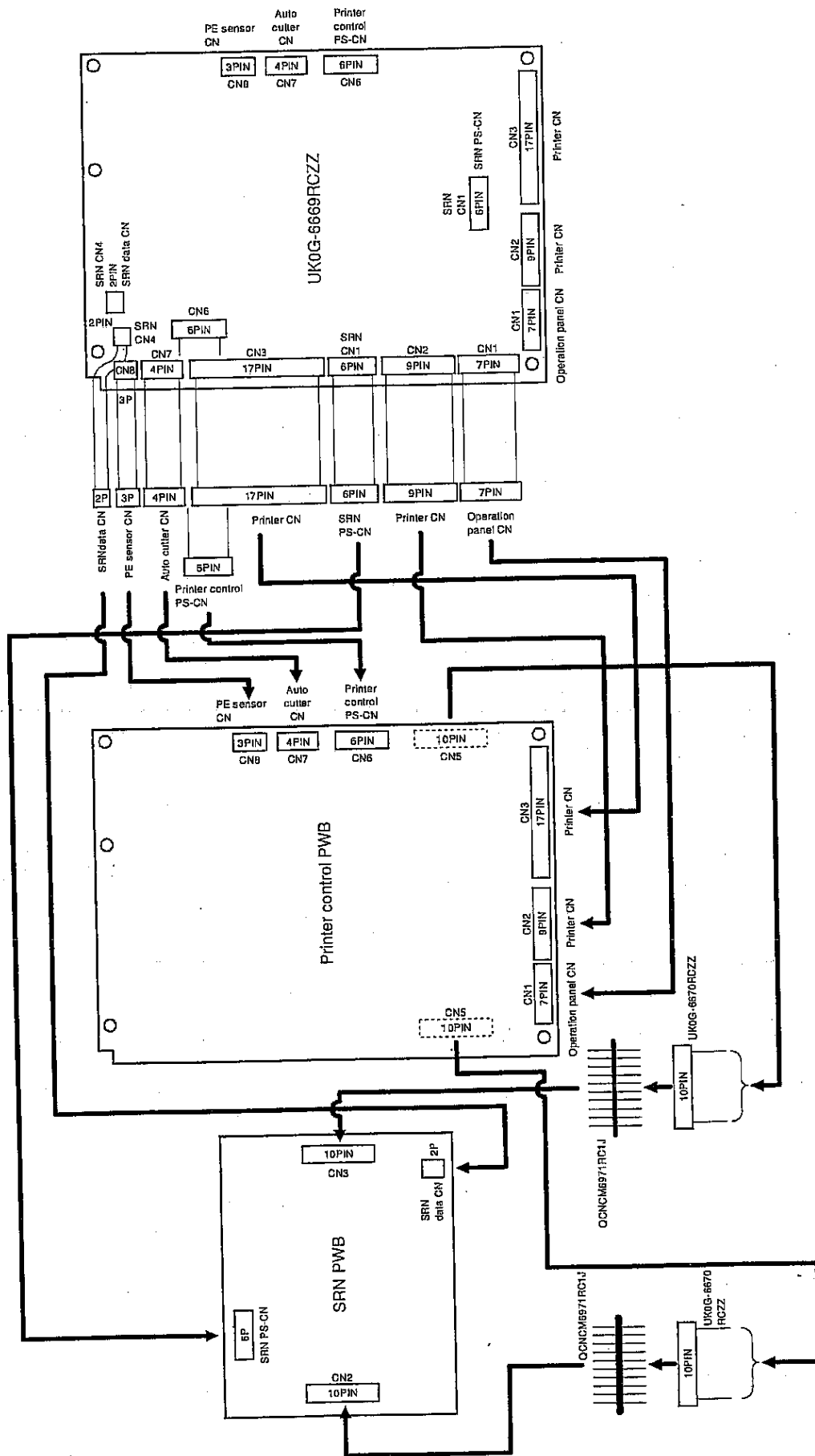
- 1) Remove the rear cover.
- 2) Disconnect all the connectors. (7 positions)
- 3) Remove the four fixing screws of the PWB and one fixing screw of the connector cover. Then the PWB's can be removed.



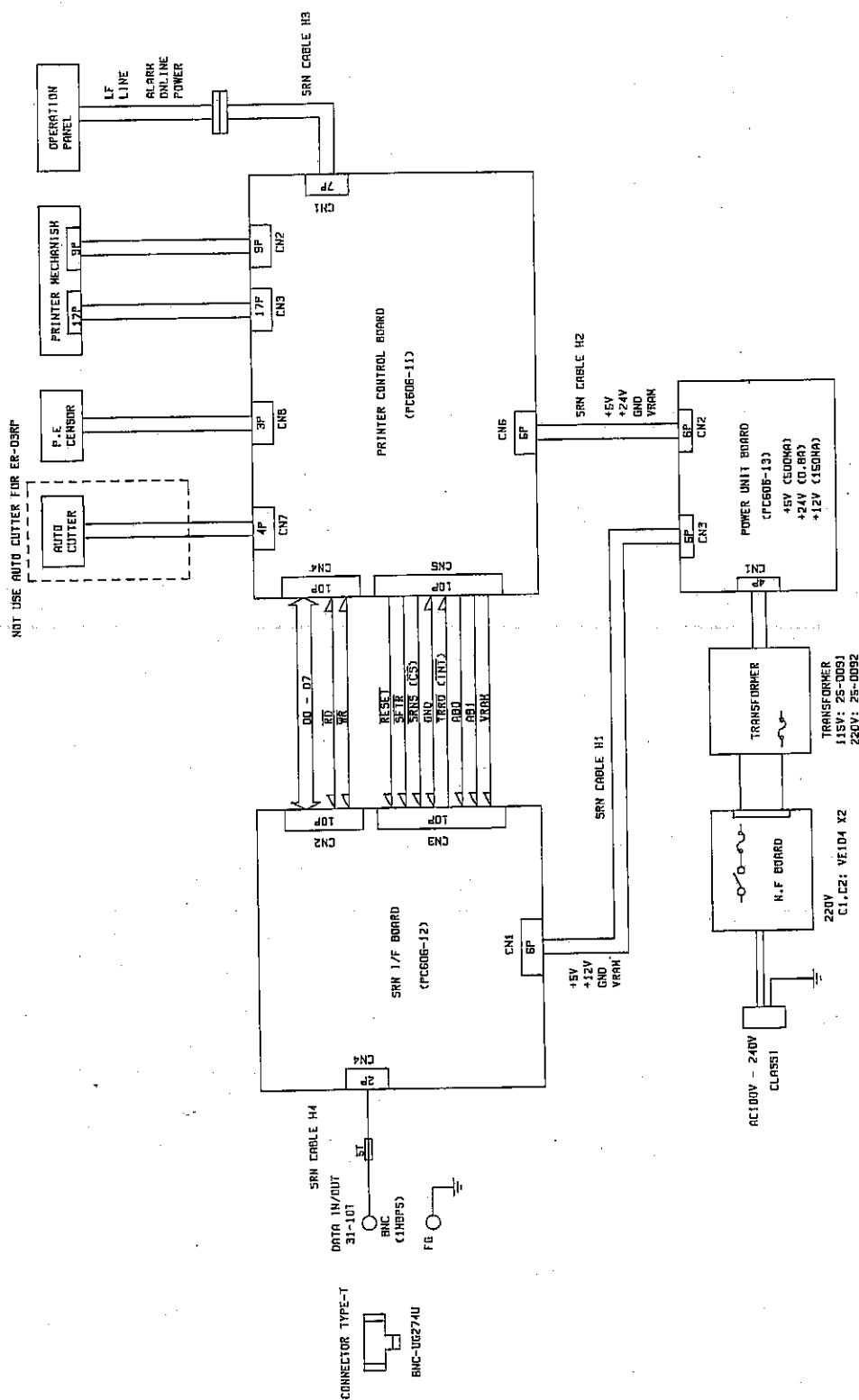
- 4) Attach the UKOG-6669RCZZ to the ER03RP body so that it comes in the position of the printer control PWB. Use the screw removed in procedure 1) for fixing.



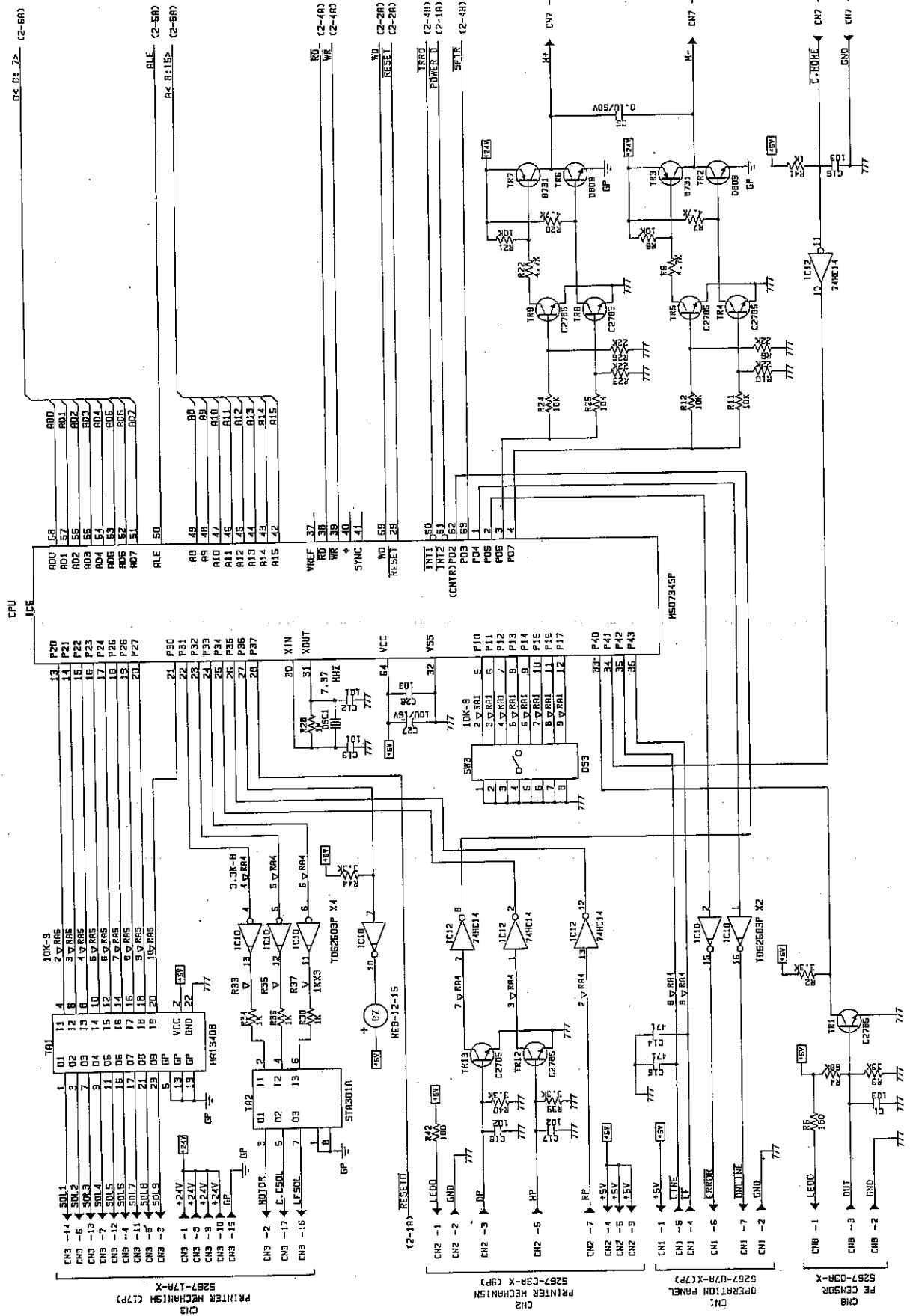
11-2. ER-03RP Service Tools connection



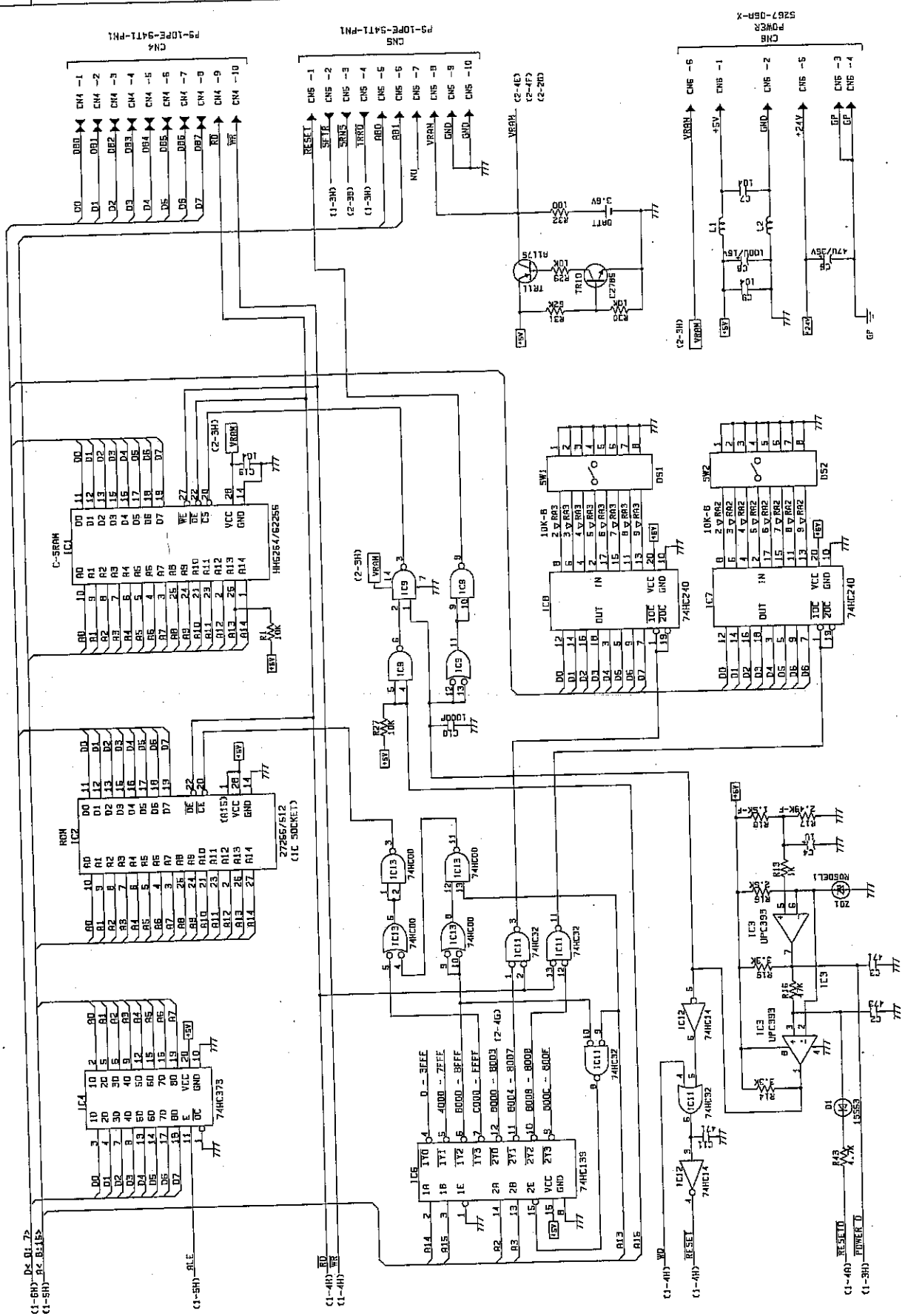
12-1. Block diagram



12-2. Printer control Board (1/2)



12-3. Printer control Board (2/2)



B < 0: 7>

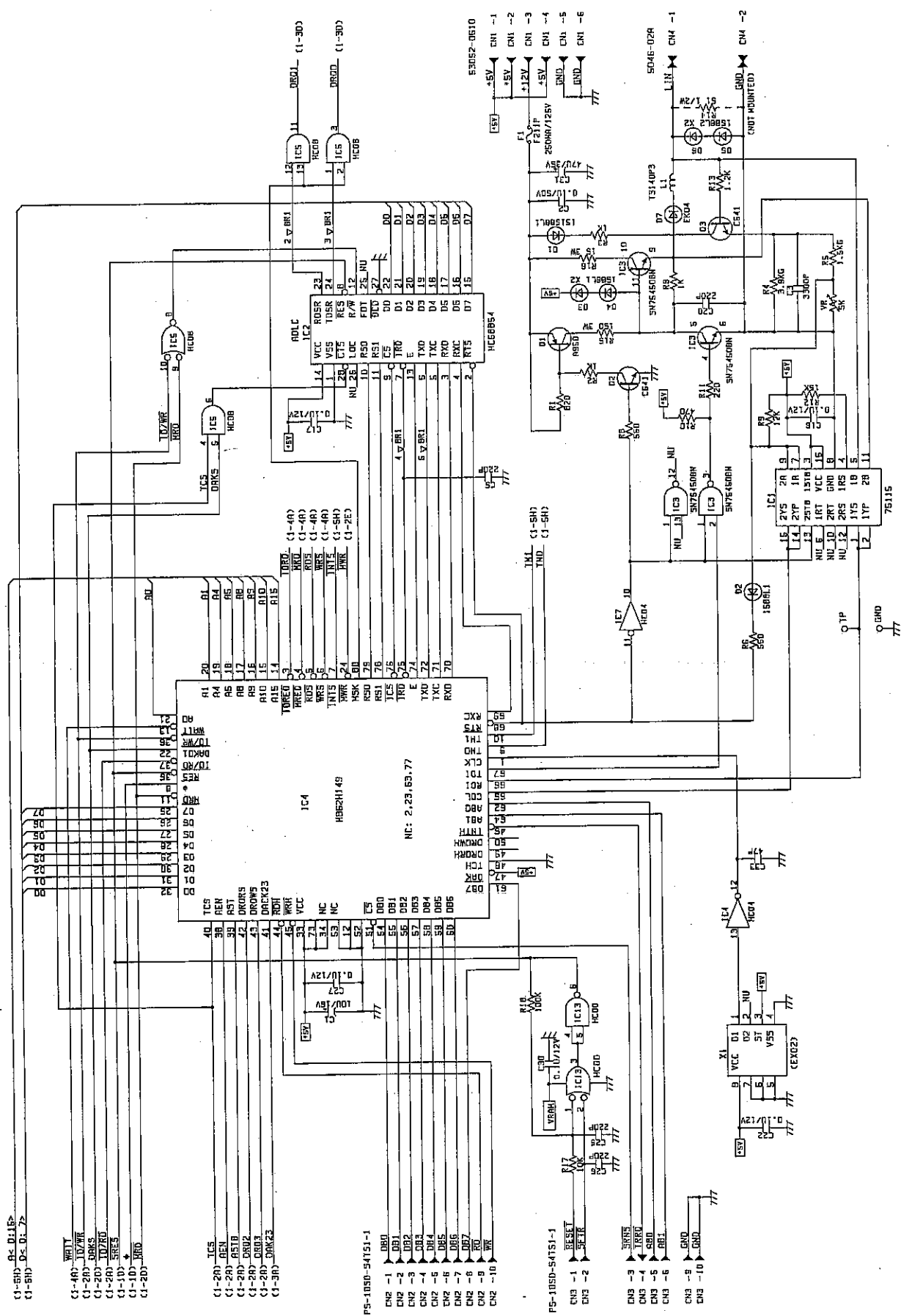
A < 0: 15>

{2-5A}

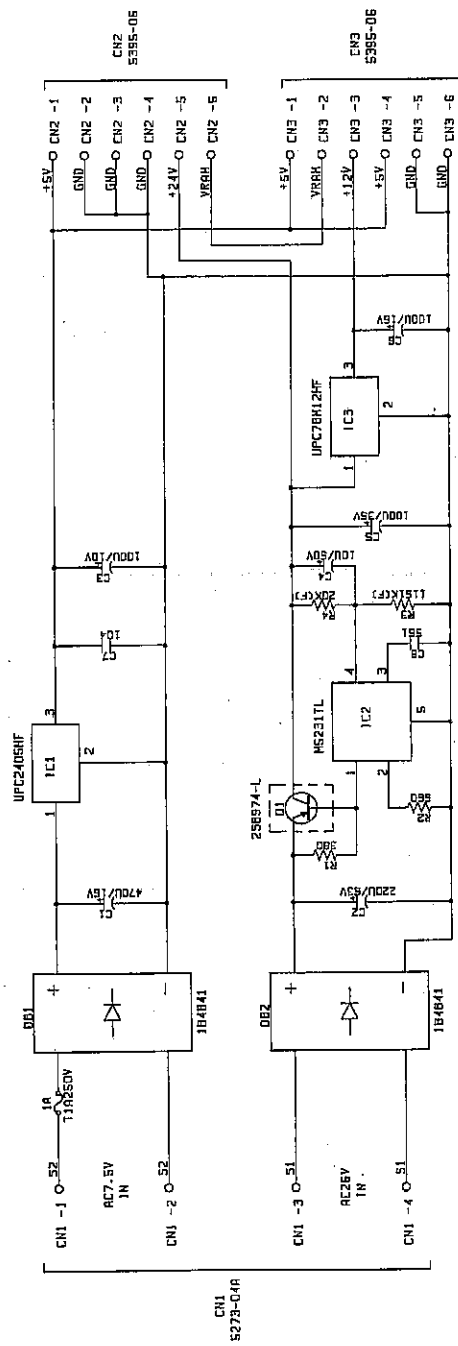
{2-5A}



12-5. S-RN I/F Board (2/2)



12-6. Power supply Board



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1990 June Printed in Japan ©